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THE FORAMINIFERA OF THE ATLANTIC OCEAN

PART 8. ROTALIIDAE, AMPHISTEGINIDAE, CALCARINIDAE CYMBALOPORETTIDAE, GLOBOROTALIIDAE, ANOMALINIDAE PLANORBULINIDAE, RUPERTIIDAE AND HOMOTREMIDAE

BY

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INTRODUCTION

This paper is the eighth and final part of a work the intent of which is to describe and illustrate the Foraminifera of the Atlantic Ocean, especially those species which have occurred in the waters adjacent to the shores of the United States, including the whole of the Gulf of Mexico and the Caribbean Sea, that being the area in which most of the work of the vessels of the United States engaged in dredging work has been done. This part includes the families Rotaliidae, Amphisteginidae, Calcarinidae, Cymbaloporettidae, Globorotaliidae, Anomalinidae, Planorbulinidae, Rupertiidae, and Homotremidae. In addition to the collection made by the Bureau of Fisheries steamer *Albatross*, shallow-water collections from the West Indian region and from along the coast from Florida to Eastport, Me., have been studied.

JOSEPH AUGUSTINE CUSHMAN.

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THE FORAMINIFERA OF THE ATLANTIC OCEAN

ROTALIIDAE, AMPHISTEGINIDAE, CALCARINIDAE, CYMBALOPORETTIDAE, GLOBOROTALIIDAE, ANOMALINIDAE, PLANORBULINIDAE, RUPERTIIDAE AND HOMOTREMIDAE

By Joseph Augustine Cushman

Of Sharon, Massachusetts

INTRODUCTION

This eighth and last part of the work on the Atlantic Foraminifera deals with the Rotaliidae, Amphisteginidae, Calcarinidae, Cymbaloporettidae, Globorotaliidae, Anomalinidae, Planorbulinidae, Rupertiidae, and Homotremidae. In order to complete the generic and family diagnoses except of those families which are not found living, the genera are included whether they have living species in the Atlantic or not. It is always possible that some of the groups now known only from the Indo-Pacific may be later found in the western tropical Atlantic, although, as this region is becoming better known, the possibility of numerous additions is less probable.

There are many species included here which are either rare or wanting in the collections made by the United States Bureau of Fisheries steamer *Albatross*, but are found in the collections from shallow water along the eastern coast of the United States or about the West Indies. Numerous species of the Rotaliidae, Anomalinidae, Planorbulinidae, etc., are found attached to seaweeds or eelgrass, and are very abundant in comparatively shallow water. Such species are often washed in on our shores in great quantities, and are to be found on beaches. They are often left in lines on the beach by the receding waves, and with shell fragments form white bands which may be scooped up and extensive collections made. The shore sands of Dog's Bay, Ireland, are classic examples of this sort of deposit.

The differences between the two sides of the Atlantic are very marked in these families, many of which have but few species in common in the shallow waters of the two areas.

A number of the species now living off the southeastern coast of the United States have already been described from the Late Tertiary of the same general region.

Papers now under way on collections from the east coast of South America and from Bermuda will add supplementary data to the records included in this bulletin.

Family 33. ROTALIIDAE

Test generally trochoid except in *Spirillina*, all the chambers visible from the dorsal side except in a very few genera which become partially involute, only those of the last-formed whorl usually visible from the ventral side; wall calcareous, usually rather coarsely perforate; aperture typically on the ventral side of the test.

As restricted here, the Rotaliidae includes those calcareous perforate forms which are trochoid, with definite dorsal and ventral sides and the aperture wholly ventral. The genera make a natural grouping closely related to one another, and the steps between the genera often well filled by the simpler or more complex species. The family may be derived through the conical forms of *Spirillina* and the simple and more primitive forms of *Patellina* and *Discorbis*. The more primitive genera have the umbilicus open, but this is filled in the higher forms. The earlier genera have simple walls, the higher ones as in *Rotalia* with double walls and a secondary canal system. There is a gradual progression from very simple structures to those foreshadowing the specialized families which are derived from the Rotaliidae.

There are a few extinct genera but most of them are known from the Cretaceous to the present seas. The geological history of the family starts with *Spirillina*, which is recorded as early as the Cambrian.

Some of the other simpler, more primitive genera had their beginnings in the Jurassic, but most of the genera do not appear until the Cretaceous, while a number of the more specialized ones are not developed until the Tertiary. There are a few records for certain genera from the Paleozoic, but these are so far as can be made out probably errors in the source of the material either through wrong labeling or insufficient care in preparation of material.

From the Rotaliidae have developed a number of specialized families, several of which are included in the present part and the relationships of which are shown in the Introduction to Part 6 of this bulletin.

Subfamily 1. SPIRILLININAE

Test simple, consisting of a proloculum, and a planispiral, undivided, tubular second chamber, open end of the tubular chamber serving as the aperture.

Genus SPIRILLINA Ehrenberg, 1841

Spirillina Ehrenberg, Abhandl. k. Akad. Wiss. Berlin, 1841, p. 422.—Cushman, Special Publ. No. 1, Cushman Lab. Foram. Res., 1928, p. 267.
Operculina (part) Reuss, 1849.
Cornuspira (part) Schultze, 1854.
Cyclolina Egger, 1857 (not d'Orbigny).

Genoholotype.—*Spirillina vivipara* Ehrenberg.

Test typically free, occasionally attached, planispiral, composed of a subglobular or ovoid proloculum and a long undivided tubular second chamber, close coiled in one plane; wall calcareous, perforate, surface smooth or variously ornamented; aperture formed by the open end of the tube.

Cambrian to Recent.

The Early Paleozoic records for this genus are fairly well substantiated and seem to show that this calcareous group has arisen independently of the truly arenaceous or agglutinated group.

SPIRILLINA VIVIPARA Ehrenberg

Plate 1, figures 1–4

Spirillina vivipara Ehrenberg, Abhandl. k. Akad. Wiss. Berlin, 1841, p. 422, pl. 3, sec. 7, fig. 41.—Williamson, Mem. Lit. Philos. Soc. Manchester, ser. 2, vol. 8, 1848, p. 45, pl., fig. 34.—Parker and Jones, Ann. Mag. Nat. Hist., ser. 2, vol. 19, 1857, p. 284, pl. 11, fig. 46.—H. B. Brady, Trans. Linn. Soc. Zool., vol. 24, 1864, p. 473 (table).—Parker and Jones, Philos. Trans., vol. 155, 1865, p. 397, pl. 15, fig. 28.—Jones, Parker, and H. B. Brady, Pal. Soc., Mon. 19, 1866, pl. 3, figs. 20–22.—Goës, Kongl. Svensk. Vet. Akad. Handl., vol. 19, 1882, p. 108, pl. 7, fig. 272.—H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 630, pl. 85, figs. 1–5.—Siddall, Proc. Lit. Philos. Soc. Liverpool, 1886, p. 70 (list).—Halkyard, Trans. Manchester Micr. Soc., 1889, p. 69.—Chaster, First Rep't Southport Soc. Nat. Sci., 1890–91 (1892), p. 65.—Egger, Abhandl. Kön. bay. Akad. Wiss. München, Cl. II, vol. 18, 1893, p. 394, pl. 18, figs. 56–58.—Flint, Rep't U. S. Nat. Mus., 1897 (1899), p. 326, pl. 71, fig. 4.—Wright, Irish Nat., 1900, p. 55.—Kiaer, Rep't Norwegian Fish. and Mar. Invest., vol. 1, No. 7, 1900, p. 23.—Chapman, Journ. Linn. Soc. Zool., vol. 28, 1902, p. 404 (list).—Millett, Journ. Roy. Micr. Soc., 1903, p. 693.—Earland, Journ. Quekett Micr. Club, ser. 2, vol. 9, 1905, p. 219.—Dakin, Rep't Pearl Oyster Fish. Ceylon, 1906, p. 237.—Rhumbler, Zool. Jahrb., Abt. Syst., vol. 24, 1906, p. 32, pl. 2, fig. 7.—Chapman, Journ. Quekett Micr. Club, ser. 2, vol. 10, 1907, p. 133.—Millett, Rec. Foram. Galway, 1908, p. 6.—Chapman, Subantarctic Islands of New Zealand, 1909, p. 352.—Heron-Allen and Earland, Journ. Roy. Micr. Soc., 1909, p. 439.—Sidebottom, Mem. Proc. Manchester Lit. Philos. Soc., vol. 54, No. 16, 1910, p. 24.—Heron-Allen and Earland, Proc. Roy. Irish Acad., vol. 31, pt. 64, 1913, p. 107, pl. 9, fig. 1.—Chapman, Biol. Res. *Endeavour*, vol. 3, pt. 1, 1915, p. 28.—Toula, Jahrb. Kais.-Kön. Geol. Reichs., vol. 64, 1914 (1915), p. 656, pl. 39, fig. 13.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 5, 1915, p. 3, pl. 1, figs. 1, 2.—Heron-Allen and Earland, Trans. Zool. Soc. London, vol. 20, 1915, p. 683, pl. 51, figs. 19–21 (22?, 23?); Journ. Roy. Micr. Soc., 1916, p. 49.—Sidebottom, Journ. Roy. Micr. Soc., 1918, p. 250.—Halkyard, Mem. Proc. Manchester Lit. Philos. Soc., vol. 62, pt. 2, 1918 (1919), p. 104.—Cushman, Proc. U. S. Nat. Mus., vol. 56, 1919, p. 623.—Heron-Allen and Earland, Bull. Soc. Sci. Hist. Nat. Corse, 1922, p. 133.—Cushman, Publ. 311, Carnegie Instit. Washington, 1922, p. 37, pl. 5, fig. 7.—Heron-Allen and Earland, British Antarctic Exped., Zool., vol. 6, 1922, p. 195, pl. 7, fig. 4.—Cushman, U. S. Geol. Survey, Prof. Paper 133, 1923, p. 36, pl. 6, fig. 1; Publ. 342, Carnegie Instit. Washington, 1924, p. 30, pl. 9, figs. 1, 2.—Heron-Allen and Earland, Journ. Linn. Soc. Zool., vol. 35, 1924, p. 628; Journ. Roy. Micr. Soc., 1924, p. 166.—Cushman, Publ. 344, Carnegie Instit. Washington, 1926, p. 77; Bull. Scripps Instit. Oceanography, Tech. Ser., vol. 1, 1927, p. 159.—Casasnovas, Not. Y Res. Inst. Esp. Ocean., ser. 2, No. 29, 1928, p. 6.—Heron-Allen and Earland, Journ. Roy. Micr. Soc., 1930, p. 178.

Test typically free, rarely adherent, planispiral, consisting of proloculum and long coiled, tubular second chamber, the later coils often somewhat uneven and not entirely planispiral, the tubular chamber overlapping slightly more on one side than on the other, sometimes flattened, periphery rounded; wall calcareous, coarsely pitted, thin; suture depressed; aperture formed by the open end of the tube.

Diameter up to 0.50–0.60 mm.

Ehrenberg originally described this species from off the Coast of Mexico, near Vera Cruz. I examined the type in the Ehrenberg collection in Berlin and the drawing given by Ehrenberg, and copied here (pl. 1, fig. 1) is an excellent one of the type specimen. The species is a fairly common one in the West Indian region, and, as the above references show, has been widely recorded elsewhere.

Whether or not the species has any such wide range as is indicated by the references is doubtful, and few of them are accompanied by figures. The figures given show the typical form and appearance of this species in the West Indian region from which it was described.

Spirillina vivipara—Material examined

Cat. No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
2650	J. A. C.	1	4	Dry Tortugas, Fla	1	------	dead coral	Rare.
2649	J. A. C.	1	8	do	1	------	m	Do.
2645	J. A. C.	1	20	do	7	------	fne. s	Do.
2647	J. A. C.	1	21	do	6	------	fne. s	Do.
2644	J. A. C.	1	22	do	6	------	fne. s	Do.
2642	J. A. C.	1	22	do	6	------	fne. s	Do.
10186	J. A. C.	1	23	do	10	------	m. s	Do.
2646	J. A. C.	1	27	do	7	------	fne. m. s	Do.
2651	J. A. C.	3	4	Largo Shoal, San Juan Harbor, Porto Rico.	1	------	--------------	Do.
12878	J. A. C.	2	4	do	1	------	--------------	Do.
12929	J. A. C.	2	------	Bermuda	1	------	--------------	Do.

SPIRILLINA VIVIPARA Ehrenberg, var. **DENSEPUNCTATA**, new variety

Plate 1, figures 5 *a*, *b*

Variety differing from the typical in the broader coils which are ornamented by very numerous, fine, and evenly spaced perforations.

Diameter, 0.35 mm.

Holotype of variety (Cushman Coll. No. 12877) from Largo Shoal, San Juan Harbor, Porto Rico, at a depth of 7 feet.

This may be specifically distinct, but material in sufficient quantity is not available for study.

Spirillina vivipara, var. *densepunctata*—*Material examined*

Cat. No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
12879	J.A.C.	1	4	Largo Shoal, San Juan Harbor, Porto Rico.	1	------	--------------	Rare.

SPIRILLINA VIVIPARA Ehrenberg, var. RUNIANA Heron-Allen and Earland.

See Heron-Allen and Earland (Journ. Roy Micr. Soc., 1930, p. 179, pl. 4, figs. 51–53). Described from the west of Scotland.

SPIRILLINA PERFORATA (Schultze)

Plate 1, figures 6, 7

Cornuspira perforata Schultze, Organ. Poly., 1854, p. 41, pl. 2, fig. 22.

Spirillina perforata Williamson, Rec. Foram. Gt. Britain, 1858, p. 92, pl. 7, fig. 202.—Terquem, Ess. Anim. Plage Dunkerque, 1875, p. 21, pl. 1, fig. 5.

Test rather regularly planispiral, coils regularly increasing in diameter as added, not flattened, periphery rounded; suture distinct, depressed; wall coarsely and rather evenly pitted, the central portion sometimes with thickened areas of secondary deposit obscuring the earlier wall; aperture formed by the open end of the chamber.

Diameter 0.45 mm.

The specimens I have from the Western coast of Europe seem to be distinct from those of the West Indian region, especially those from the coast of Belgium figured here. The pits of the surface are of smaller size and much more even in their placing on the surface. There is also a tendency to secondary thickening not noted in West Indian *S. vivipara* Ehrenberg.

Terquem records this species from the Eocene of the Paris Basin, but the fossil form is probably distinct.

SPIRILLINA MARGARITIFERA Williamson

Plate 1, figure 11

Spirillina margaritifera Williamson, Rec. Foram. Gt. Britain, 1858, p. 93, pl. 7, fig. 204.—Terquem, Mém. Soc. Géol. France, sér. 3, vol. 1, 1878, p. 10; Ess. Anim. Dunkerque, 1881, p. 110, pl. 13, figs. 2*a*,*b*.

Spirillina tuberculata H. B. Brady (part), Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 631 (not pl. 85, figs. 12–16).—Balkwill and Wright, Trans. Roy. Irish Acad., vol. 28, Sci., 1885, p. 349.—Siddall, Proc. Lit. Philos. Soc. Liverpool, 1886, p. 70 (list).

Test planispiral, the coils rather uniformly increasing in diameter as added, periphery rounded; wall ornamented by numerous projecting tubercles arranged in either one or two series; aperture formed by the open end of the tubular chamber.

Diameter 0.50 mm.

This species is described and figured by Williamson who compares it with *Spirillina perforata* and stresses the fact that in his species the "large foramina" of *S. perforata* are absent, and it is marked by small protuberances. Such specimens seem to be present in Recent material from Western Europe. There are numerous records for *Spirillina margaritifera*, but some of them evidently are not like the original and belong in different species, as is noted in the synonymy of some of the following species. Some of the figures referred by Heron-Allen and Earland to *Spirillina vivipara* [1] seem to belong to Williamson's species. They are from the West of Scotland. Some of the records of *S. tuberculata* from about the British Isles are evidently this species.

SPIRILLINA OBCONICA H. B. Brady (?)

Plate 1, figures 8–10

Under this name Heron-Allen and Earland record and figure specimens from the Clare Island region of Ireland.[2] Their figures are copied here. The types of this species are from the South Pacific and Antarctic, and there are numerous other records from the South Pacific. Their original figures of Irish specimens are here copied as well as a figure of a specimen kindly sent me by Earland from *Porcupine* Station 7, Third Cruise 1870, 48° 18′ N.; 9° 11′ W.; 93 fathoms.

Spirillina obconica—Material examined

Cat. No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
12807	J.A.C.	2	*Goldseeker* 16	Off Faroe Islands				Rare.
12880	J.A.C.	1	*Porcupine* 7	48° 18′ 00″ N.; 9° 11′ 00″ W.	93			Do.

SPIRILLINA LATESEPTATA Terquem

Plate 1, figures 12, 13; plate 2, figure 1

Spirillina lateseptata Terquem, Ess. Anim. Dunkerque, 1875, p. 21, pl. 1, fig. 6.

Spirillina vivipara Ehrenberg, var. *carinata* Halkyard, Trans. Manchester Micr. Soc., 1889, p. 69, pl. 2, fig. 6.—Sidebottom, Mem. Proc. Manchester Lit. Philos. Soc., vol. 52, No. 13, 1908, p. 8, pl. 2, fig. 4.

Spirillina obconica H. B. Brady, var. *carinata* Heron-Allen and Earland, Proc. Roy. Irish Acad., vol. 31, pt. 64, 1913, p. 109, pl. 9, figs. 6, 7; Trans. Linn. Soc. London, ser. 2, vol. 11, 1916, p. 269; Journ. Roy. Micr. Soc., 1916, p. 49; British Antarctic Exped., Zoology, vol. 6, 1922, p. 195; Journ. Roy. Micr. Soc., 1930, p. 180.

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[1] Trans. Linn. Soc. London, ser. 2, vol. 11, 1916, pl. 42, figs. 23, 24.

[2] Proc. Roy. Irish Acad., vol. 31, pt. 64, 1913, p. 108, pl. 9, figs. 8, 9.

Test planispiral, very much compressed, usually slightly elliptical in outline, periphery acute, often keeled and the keel broken into a series of distinct teeth; coiled chamber with the cavity of the chamber near the outer part of the coil, built out beyond the keel of the previous coil; aperture elliptical at the end of the tubular chamber.

Diameter 0.20–0.30 mm.

This is a very interesting species which is apparently localized about the British Isles and the coasts of France and Belgium and extending into the Mediterranean, although Heron-Allen and Earland have recorded it also from the Antarctic.

Terquem evidently was the first to give a name to this peculiar form in 1875. His figure like most of his illustrations is not detailed, but he shows the thin plate-like keel with the main chamber on the periphery. His specimens were from Dunkerque. Halkyard later figured and described this from off Jersey, and there are numerous other records as noted above. I have specimens from off the Belgian coast, and thanks to Earland some from *Porcupine* Station 7, one of which is here figured.

The keel is often beautifully toothed or may be broken and only represented by jagged angular bits. It is an extremely thin and delicate species.

Spirillina lateseptata—Material examined

Cat-No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
12806	J.A.C.	4	*Goldseeker* 16	Off Faroe Islands	-------	------	--------------	Few.
12881	J.A.C.	2	*Porcupine* 7	48° 18′ 00″ N.; 9° 11′ 00″ W.	-------	------	--------------	Rare.

SPIRILLINA LIMBATA H. B. Brady

Plate 2, figures 2 *a*, *b*

Spirillina limbata H. B. Brady, Quart. Journ. Micr. Sci., vol. 19, 1879, p. 278, pl. 8, fig. 26 *a*, *b;* Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 632, pl. 85, figs. 18–21.—Siddall, Proc. Lit. Philos. Soc. Liverpool, 1886, p. 70, (list).—Egger, Abhandl. kön. bay. Akad. Wiss. München, Cl. II, vol. 18, 1893, p. 395, pl. 18, figs. 43, 44.—Flint, Rep't U. S. Nat. Mus., 1897 (1899), p. 326, pl. 71, fig. 5.—Chapman, Journ. Linn. Soc. Zool., vol. 28, 1902, p. 404 (list).—Millett, Journ. Roy. Micr. Soc., 1903, p. 694.—Goddard, Rec. Australian Mus., vol. 6, 1905–1908 (1908), p. 309.—Dakin, Rept. Pearl Oyster Fish. Ceylon, 1906, p. 237.—Chapman, Subantarctic Islands of New Zealand, 1909, p. 353; Biol. Res. *Endeavour*, vol. 3, pt. 1, 1915, p. 28.—Heron-Allen and Earland, Trans. Zool. Soc. London, vol. 20, 1915, p. 684.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 5, 1915, p. 5, pl. 2, figs. 1, 2.—Heron-Allen and Earland, Journ. Roy. Micr. Soc., 1916, p. 49.—SIDEBOTTOM, Journ. Roy. Micr. Soc., 1918, p. 249.—CUSHMAN, Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 301.—HERON-ALLEN and EARLAND, British Antarctic Exped., Zoology, vol. 6, 1922, p. 196; Journ. Linn. Soc. Zool., vol. 35, 1924, p. 628.—CUSHMAN, Publ. 342, Carnegie Instit., Washington, 1924, p. 30.

"Test planospiral, thin, equilateral, discoidal; lateral faces flat or only slightly concave; peripheral edge square. Spiral sutural line marked externally by a raised border of shelly deposit; surface otherwise smooth. Diameter 1/30 to 1/60 inch (0.42 to 0.84 mm.)."

The above description is from the original of Brady. Among other localities he mentions one in the North Atlantic and three in the South Atlantic. The figured specimens which are after Brady are from off Brazil. I have not found this species in the *Albatross* dredgings, although Dr. J. M. Flint records it.

Most of the records are from the Pacific.

SPIRILLINA LIMBATA H. B. Brady, var. DENTICULATA H. B. Brady

Plate 2, figures 4, 5

Spirillina limbata H. B. BRADY, var. *denticulata* H. B. BRADY, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 632, pl. 85, fig. 17.—EGGER, Abhandl. kön. bay. Akad. Wiss. München, Cl. II, vol. 18, 1893, p. 396, pl. 18, fig. 66.—MILLETT, Journ. Roy. Micr. Soc., 1903, p. 694.—GODDARD, Rec. Australian Mus., vol. 6, 1905–1908 (1908), p. 309.—CHAPMAN, Subantarctic Islands of New Zealand, 1909, p. 354, pl. 17, fig. 2.—HERON-ALLEN and EARLAND, Proc. Roy. Irish Acad., vol. 31, pt. 64, 1913, p. 109, pl. 9, fig. 10; Trans. Zool. Soc. London, vol. 20, 1915, p. 685.—CUSHMAN, Bull. 71, U. S. Nat. Mus., pt. 5, 1915, p. 5, pl. 3, figs. 1, 2; Proc. U. S. Nat. Mus., vol. 56, 1919, p. 624; Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 302.—HERON-ALLEN and EARLAND, British Antarctic Exped., Zoology, vol. 6, 1922, p. 197.

Spirillina margaritifera WRIGHT (not Williamson), Proc. Belfast Nat. Field Club, Appendix, 1885–86, p 321, pl. 26, figs. 12, *a*, *b*.—HALKYARD, Trans. Manchester Micr. Soc., 1889, p. 69, pl. 2, fig. 7.

"External form and general characters of the test resembling those of *Spirillina limbata;* the raised spiral band covering the sutural line furnished with buttress-like teeth, set at regular intervals along its inner margin."

The above description given by Brady does not mention the differences in the two sides of the test in this variety. The dorsal side is as described, but the ventral side has large scattered tubercles obscuring the suture line.

Such specimens as that figured by Halkyard would seem to belong to this variety. In the specimens figured from the Belgian coast (pl. 2, fig. 5) the dorsal side has a double row of pits inside the raised ridge.

To the form described by Wright and Halkyard Heron-Allen and Earland (Journ. Roy. Micr. Soc., 1930, p. 181, pl. 4, figs. 54–58) have given the name *Spirillina wrightii*.

Most of the records for this variety are from the Indo-Pacific where the variety is a common one.

Spirillina limbata, var. *denticulata*—*Material examined*

Cat. No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
10171	J.A.C.	1	------	Off Plymouth, England----------	--------	------	--------------	Rare.

SPIRILLINA DECORATA H. B. Brady

Plate 2, figure 3

Spirillina decorata H. B. BRADY, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 633, pl. 85, figs. 22, 25.—EGGER, Abhandl. kön. bay. Akad. Wiss. München, Cl. II, vol. 18, 1893, p. 394, pl. 18, figs. 64, 65.—WOODWARD, The Observer, vol. 4, 1893, p. 176.—MILLETT, Journ. Roy. Micr. Soc., 1903, p. 695.—DAKIN, Rep't Pearl. Oyster Fish. Ceylon, 1906, p. 237.—RHUMBLER, Zool. Jahrb., Abt. Syst., vol. 24, 1906, p. 33, pl. 2, fig. 11 (?).—CHAPMAN, Subantarctic Islands of New Zealand, 1909, p. 353.—CUSHMAN, Bull. 71, U. S. Nat. Mus., pt. 5, 1915, p. 7, pl. 5, figs. 1, 2.—HERON-ALLEN and EARLAND, Trans. Zool. Soc. London, vol. 20, 1915, p. 685.—SIDEBOTTOM, Journ. Roy. Micr. Soc., 1918, p. 250.—CUSHMAN, Proc. U. S. Nat. Mus., vol. 56, 1919, p. 623.—HERON-ALLEN and EARLAND, British Antarctic Exped., Zoology, vol. 6, 1922, p. 197; Journ. Linn. Soc. Zoology, vol. 35, 1924, p. 628.

"Test free, discoidal, bilaterally symmetrical or nearly so; composed of six or eight convolutions of a somewhat embracing tube. Lateral faces slightly concave, peripheral edge thin and subcarinate; perforations obscure in thick-walled specimens, the surfaces of which become pitted and furrowed; aperture of the adult somewhat contracted and triangular. Diameter ⅟₃₀ inch (0.84 mm.) or more."

Brady's records for this species include the following Atlantic *Challenger* records: off the Azores, 1,000 fathoms; off the Canaries, 1,125 fathoms; off Culebra Island, 390 fathoms, and off Pernambuco, 675 fathoms. The figured specimen is from the station off the Canaries (after Brady). Most of the later records for this species are from the Pacific, although Egger records it from West Africa.

SPIRILLINA GROOMII Chapman (?)

Under this name Heron-Allen and Earland figure a peculiar specimen from the Clare Island region.[3] The figure in some ways resembles the coiled operculum of a mollusk. Chapman originally described the species from the Cambrian of the Malverns. The recent record rests upon the single specimen from the Clare Island region and a specimen from Plymouth, England, recently recorded by Heron-Allen and Earland (Journ. Roy. Micr. Soc., 1930, p. 180, pl. 4, figs. 49, 50).

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[3] Proc. Roy. Irish Acad., vol. 31, pt. 64, 1913, p. 107, pl. 9, figs. 2, 3.

SPIRILLINA LUCIDA Sidebottom

Under this name Sidebottom described and figured a low conical specimen from off the Island of Delos in the Mediterranean.[4] A few specimens from the Clare Island region of Ireland are referred to this species by Heron-Allen and Earland.[5]

SPIRILLINA CANALICULATA Terquem

SPIRILLINA NODOSA Terquem

Under these names Terquem figures two specimens from the coast of Dunkerque, but nothing further is known of them.[6]

Subfamily 2. TURRISPIRILLININAE

Test simple, consisting of a proloculum and spirally coiled, undivided second chamber.

Genus TURRISPIRILLINA Cushman, 1927

Turrispirillina Cushman, Contr. Cushman Lab. Foram. Res., vol. 3, 1927, p. 73; Special Publ. No. 1, Cushman Lab. Foram. Res., 1928, p. 267.
Spirillina (part) of Authors.

Genoholotype.—Spirillina conoidea Paalzow.

Test composed of a proloculum and elongate, tubular, undivided second chamber in a hollow conical spire, the coils not appreciably involute; aperture, a semicircular opening at the periphery.

I have no Atlantic material that could be definitely referred to this genus although some of the species of *Spirillina* tend to have slightly conical forms.

Genus CONICOSPIRILLINA Cushman, 1927

Conicospirillina Cushman, Contr. Cushman Lab. Foram. Res., vol. 3, 1927, p. 73; Special Publ. No. 1, Cushman Lab. Foram. Res., 1928, p. 267.
Spirillina Berthelin, 1879 (not Ehrenberg).

Genoholotype.—Spirillina trochoides Berthelin.

Test coiled in a conical spiral chamber completely involute on the ventral side; wall calcareous, perforate; aperture, a narrow slit on the ventral face of the revolving chamber from the periphery toward the umbilicus.

Subfamily 3. DISCORBISINAE

Test chambered, trochoid, umbilical region generally open, dorsal side with all chambers visible, only those of the last-formed whorl visible from the ventral side; aperture ventral, not extending out to the periphery.

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[4] Mem. Proc. Manchester Lit. Philos. Soc., vol. 52, No. 13, 1908, p. 9, pl. 2, fig. 9.

[5] Proc. Roy. Irish Acad., vol. 31, pt. 64, 1913, p. 108, pl. 9, figs. 4, 5.

[6] Ess. Anim. Dunkerque, pt. 3, 1881, pl. 13, figs. 1, *a*, *b*, and 13, *a*, *b*.

Genus PATELLINA Williamson, 1858

Patellina Williamson, Rec. Foram. Gt. Britain, 1858, p. 46.—H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 633.—Chapman, The Foraminifera, 1902, p. 216.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 5, 1915, p. 8; Special Publ. No. 1, Cushman Lab. Foram. Res., 1928, p. 268.

Genoholotype.—Patellina corrugata Williamson.

Test conical or plano-convex, early whorls undivided, and occasionally entire specimens without divisions and like *Spirillina*, later ones usually divided into long chambers often with internal sinuous septa; wall calcareous, perforate, thin; aperture elongate at the base of the ventral side of the chamber.

This genus is a simple and primitive one with the microspheric form especially showing often a long undivided second chamber of several coils before the chambered condition is taken on. It is found in the Permian, and continues to the present oceans. (For notes on the various species see Cushman, Some Notes on the Genus Patellina—Contr. Cushman Lab. Foram. Res., vol. 6, 1930, pp. 11–17, pl. 3.)

Patellina corrugata—Material examined

Cat. No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
10175	J. A. C.	1		Coast of Iceland				Rare.
12882	J. A. C.	1		Grundare, Iceland				Do.
9338	J. A. C.	1		Off Plymouth, England				Do.
?83	J. A. C.	1	Lord Bandon Log 28.	Off Southwest Ireland	26			Do.
10610	J. A. C.	1		Montego Bay, Jamaica				Do.
12930	J. A. C.	1		Long Bay, Somerset, Bermuda.	5			Do.

PATELLINA CORRUGATA Williamson

Plate 2, figures 6, 7

Patellina corrugata Williamson, Rec. Foram. Gt. Britain, 1858, p. 46, pl. 3, figs. 86–89.—H. B. Brady, Trans. Linn. Soc. Zool., vol. 24, 1864, p. 471; Nat. Hist. Trans. Northumberland and Durham, vol. 1, 1865 (1867), p. 105.—Parker and Jones, Philos. Trans., vol. 155, 1865, p. 398, pl. 15, figs. 29 *a-c*.—H. B. Brady, Ann. Mag. Nat. Hist., ser. 4, vol. 6, 1870, p. 66.—Terquem, Essai Class. Anim. Dunkerque, 1875, p. 31, pl. 4, figs. 3*a*, *b*.—H. B. Brady, Ann. Mag. Nat. Hist., ser. 5, vol. 8, 1881, p. 412; Denkschr. Akad. Wiss., vol. 43, 1881, p. 16; Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 634, pl. 86, figs. 1–7.—Balkwill and Wright, Trans. Roy. Irish Acad., vol. 28, 1885, p. 349.—Siddall, Proc. Lit. Philos. Soc. Liverpool, 1886, p. 70.—Halkyard, Trans. Manchester Micr. Soc., 1889, p. 69.—Chaster, First Rep't Southport Soc. Nat. Sci., 1890–91 (1892), p. 65.—Wright, Proc. Roy. Irish Acad., ser. 3, vol. 1, 1891, p. 489.—Woodward, The Observer, vol. 4, 1893, p. 176.—Goës, Kongl. Svensk. Vet. Akad. Handl., vol. 25, No. 9, 1894, p. 92.—Morton, Proc. Portland Soc. Nat. Hist., vol. 2, 1897, p. 120.—Reade, Geol. Mag., dec. 4, vol. 7, 1900, pl. 5, fig. 20.—Wright, Irish Nat., vol. 9, 1900, p. 55.—Kiaer, Rep't Norwegian Fish. Mar. Invest., vol. 1, No. 7, 1900, p. 23.—Whiteaves, Geol. Surv. Canada, 1901, p. 10.—

Earland, Journ. Quekett Micr. Club, ser. 2, vol. 9, 1905, p. 220.—Millett, Rec. Foram. Galway, 1908, p. 6.—Cushman, Proc. Boston Soc. Nat. Hist., vol. 34, 1908, p. 29, pl. 5, fig. 3.—Sidebottom, Mem. Proc. Manchester Lit. Philos. Soc., vol. 52, 1908, p. 9.—Heron-Allen and Earland, Journ. Roy. Micr. Soc., 1909, p. 441.—Sidebottom, Mem. Proc. Manchester Lit. Philos. Soc., vol. 54, No. 16, 1910, p. 24.—Heron-Allen and Earland, Proc. Roy. Irish Acad., vol. 31, pt. 64, 1913, p. 109, pl. 9, fig. 11.—Pearcey, Trans. Roy. Soc. Edinburgh, vol. 49, 1914, p. 1026.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 5, 1915, p. 9, pl. 7, fig. 1.—Heron-Allen and Earland, Journ. Roy. Micr. Soc., 1916, p. 49; Trans. Linn. Soc. London, vol. 11, 1916, p. 269.—Cushman, Contr. Canadian Biol., 1921 (1922), p. 11.—Hofker, Flora en Fauna de Zuiderzee, Protozoa, 1922, p. 134, fig. 13 *a-d* (in text).—Casasnovas, Not. Y. Res. Instit. Esp. Ocean., ser. 2, No. 29, 1928, p. 6.—Palmer, Journ. Pal., vol. 3, 1929, p. 306.—Cushman, Contr. Cushman Lab. Foram. Res., vol. 6, 1930, p. 15, pl. 3, figs. 5, *a-c*.

Test usually free, conical, or plano-convex; early portion composed of chambers spirally arranged, later ones elongating and finally becoming annular or nearly so in the last-formed portion of the test; chambers partially divided by internal septa which are visible from the exterior, showing clearly in the last-formed chambers from the ventral side; somewhat umbilicate ventrally; walls comparatively thin and translucent; aperture somewhat elongate situated at the inner border of the chamber.

Diameter up to 0.65 mm.

This species is fairly common, especially on the coasts of Western Europe and in the Mediterranean, and it occurs on the eastern and western coasts of North America, but in the Indo-Pacific region in general appears to be replaced by *P. advena* Cushman which is a somewhat more specialized species having finer but more complex lobes in the chambers.

The earliest stages of the microspheric form of *Patellina corrugata* may be easily mistaken for a small somewhat conical *Spirillina*.

Genus DISCORBIS Lamarck, 1804

Discorbis Lamarck, Ann. Mus., vol. 5, 1804, p. 183.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 5, 1915. p. 10; Special Publ. No. 1, Cushman Lab. Foram. Res., 1928, p. 270.

Rosalina d'Orbigny, Ann. Sci. Nat., vol. 7, 1826, p. 271 (genotype, by designation, *Rosalina globularis* d'Orbigny).

Turbinulina (part) d'Orbigny, 1826.

Allotheca Ehrenberg, Abhandl. k. Akad. Wiss. Berlin, 1841, p. 407 (genoholotype, *Allotheca megathyra* Ehrenberg).

Phanerostomum Ehrenberg, Abhandl. k. Akad. Wiss. Berlin, 1841, p. 409 (genotype, by designation, *Phanerostomum integerrimum* Ehrenberg).

Platyoecus Ehrenberg, Mikrogeologie, 1854, pl. 30, fig. 28 (genoholotype, *Platyoecus squama* Ehrenberg).

Aristerospira Ehrenberg, Monatsber. k. preuss. Akad. Wiss. Berlin, 1858, p. 11 (genotype, by designation, *Aristerospira isoderma* Ehrenberg).

Discorbina Parker and Jones, in Carpenter, Parker and Jones, Introd. Foram., 1862, p. 203 (genotype, *Rotalia* (*Trochulina*) *turbo* d'Orbigny).

Genotype, by designation.—*Discorbis vesicularis* Lamarck.

Test typically plano-convex, the ventral side flattened, early portion sometimes showing a long *Spirillina*-like second chamber before division; chambers often produced to partially cover the umbilical area; wall calcareous, perforate; aperture at the base of the umbilical margin on the ventral side of the chamber.

Lower Cretaceous to Recent.

Discorbis is a simple genus, in many of its species showing considerable complexity, but typically the species have a depressed umbilicus although sometimes covered by ingrowing portions of the chambers. The aperture is in the general umbilical region or at the base of the chamber near it. Some of the Indo-Pacific species become much ornate and highly developed while most of those of cool waters are fairly simple in form and structure.

There are so many specific names used here that they are arranged alphabetically for easier reference.

DISCORBIS ADVENA Cushman

Plate 2, figures 8 *a–c*

Discorbina rosacea H. B. Brady (part) (not d'Orbigny), Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 644, pl. 87, fig. 1.—Flint, Rep. U. S. Nat. Mus., 1897 (1899), p. 327, pl. 72, fig. 3.

Discorbis advena Cushman, Publ. 311, Carnegie Instit. Washington, 1922, p. 40.

Test rotaliform, dorsally convex, ventrally concave, composed of numerous chambers, usually 6 in the last-formed coil, distinct, the periphery rounded in the final chambers, earlier development with a rather acute edge; sutures distinct, very slightly depressed, oblique; wall thin, translucent, very finely perforate; on the ventral side the test is umbilicate, the chambers ending in a peculiar inflated point; aperture a very narrow, slightly curved opening at the base of the inner margin of the last-formed chamber.

Diameter up to 0.50 mm.

Discorbis advena—Material examined

Cat. No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
2667	J.A.C.	1	4	Dry Tortugas, Fla	1	------	dead coral	Rare.
2665	J.A.C.	2	10	do	11	------	s	Do.
2660	J.A.C.	2	12	do	7	------	hrd. bot	Do.
2661	J.A.C.	1	14	do	12	------	fne. s	Do.
2664	J.A.C.	1	19	do	5.75	------	fne. s	Do.
2658	J.A.C.	5	20	do	7	------	fne. s	Few.
2663	J.A.C.	5	21	do	7	------	fne. s	Do.
2657	J.A.C.	3	22	do	6	------	fne. s	Rare.
2666	J.A.C.	3	22	do	6	------	fne. s	Do.
2659	J.A.C.	5	23	do	10.5	------	m. s	Few.
2656	J.A.C.	2	27	do	7	------	fne. m. s	Rare.
2668	J.A.C.	4	28	do	4.75	------	fne. s	Few.
2662	J.A.C.	4	37	do	11	------	fne. s	Do.

This species is common at the Tortugas off Florida and is probably widely distributed in the West Indian region. The figure in the *Challenger* Report referred to above is not the same as the species represented by d'Orbigny's Model. In the Tortugas region at least there is very little variation, and the species is well defined.

DISCORBIS ARAUCANA (d'Orbigny)

This species was described by d'Orbigny from the coast of Chile. I have not seen it in the material from the Western Atlantic, although it occurs in the Pacific. The Atlantic records are "Cottage City, Cape Cod" Marthas Vineyard, Woodward,[7] Clare Island Region, Ireland, Heron-Allen and Earland,[8] and Zuiderzee, Holland, Hofker.[9] I have had much material from the general region from which Woodward's records were obtained, but have no specimens of this species. Hofker's figures do not seem to be identical with d'Orbigny's species, and Heron-Allen and Earland do not figure their specimens. Their remarks are as follows: "A few specimens in two shore sands and one dredging which appear to be referable to this species. It is not a very satisfactory type, but serves as a connecting link between the group of *D. rosacea* and *D. globularis*."

DISCORBIS AUBERII (d'Orbigny)

Rosalina auberii D'ORBIGNY, in De la Sagra, Hist. Fis. Pol. Nat. Cuba, 1839, "Foraminifères," p. 94, pl. 4, figs. 5–8.

Discorbis auberii CUSHMAN, Proc. U. S. Nat. Mus., vol. 59, 1921, p. 59, pl. 14, figs. 1–3; Publ. 311, Carnegie Instit. Washington, 1922, p. 40; Publ. 344, 1926, p. 78.

Discorbis auberii—Material examined

Cat. No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
2672	J.A.C.	1	10	Dry Tortugas, Fla.	11		s.	Rare.
2671	J.A.C.	1	2	San Juan Harbor, Porto Rico	3			Do.
2670	J.A.C.	3	9	Ponce, Porto Rico	.5			Do.

Test rotaliform, with a low spire, periphery carinate, acute, the ventral side slightly if at all convex; chambers in several whorls with four chambers in each; sutures distinct, somewhat depressed, oblique on the dorsal side, nearly radiate on the ventral; wall rather coarsely perforate; aperture a curved, narrow slit at the base of the last-formed chamber.

Diameter 0.40 mm.

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[7] The Observer, vol. 4, 1893, p. 176.

[8] Proc. Roy. Irish Acad., vol. 31, pt. 64, 1913, p. 126.

[9] Flora en Fauna der Zuiderzee, Protozoa, 1922, p. 152, fig. 49 (in text).

This species was originally described by d'Orbigny from the coasts of Cuba and Martinique, and I have recorded it from Porto Rico, Jamaica, and from the Tortugas off the coast of Florida. It seems to be a rare form, although well distributed in the West Indian region.

DISCORBIS BACCATA (Heron-Allen and Earland)

Plate 3, figures 1 *a-c*

Discorbina baccata Heron-Allen and Earland, Proc. Roy. Irish Acad., vol. 31, pt. 64, 1913, p. 124, pl. 12, figs. 1–3; Trans. Linn. Soc. London, ser. 2, vol. 11, 1916, p. 271; Journ. Roy. Micr. Soc., 1916, p. 50; 1930, p. 183.

"Test free, circular or nearly so in outline, peripheral edge subacute, consisting of about three convolutions, the last convolution having seven to nine oblique chambers; superior face conical, rounded at the apex; inferior face almost flat, the central region filled with a raised star-like stud of solid shell matter, the short points of the star directed toward the sutural lines, which are somewhat depressed on the base, but flush and hardly recognizable on the superior side of the shell. The surface of the chambers on the inferior side slopes downward toward the centre, so that the top of the star-like stud is about on the same level as or slightly raised above the peripheral edge.

"The entire surface of the shell is shagreened or densely covered with minute beads, between which are the pseudopodial perforations. On the superior or conical side of the test these beads are not very noticeable except under a ⅔ or ½ inch objective, although their presence gives a characteristic roughness to the surface of the shell. On the base, however, they attain much larger dimensions, and are arranged regularly in radial lines.

"In living specimens the shell is polished and of a dull yellowish translucent tint. After death, however, it becomes white and opaque, and appears to be subject to rapid decomposition, the surface becoming rough and eroded. This appears to be commonly the case with Foraminifera in which the surface is covered with exogenous bead growth, *e. g. Discorbina parisiensis, D. wrightii*, etc.

"*Discorbina baccata* belongs to the *D. rosacea* group, and occupies a position about midway between *Discorbina* (*Asterigerina*) *rosacea* d'Orbigny, *Asterigerina planorbis* d'Orbigny, and *Discorbina* (*Trochulina*) *turbo* d'Orbigny. It resembles the last form most closely in its flattened base, but differs in its sunken septal lines on the basal surface and in its characteristic basal stud and beaded surface.

"Breadth, 0.3–0.4 mm.; height, 0.2 mm. Beads average about 0.008 mm. Diameter of umbilical star about 0.1 mm.

"The species is fairly common in the dredging from Inishgowla harbour (Station 13) and in other gatherings among the islands.

Also at Station 15, Feorinyeo Bay. We have the same form from the shore sand of Swanage, County Dorset, where it is frequent, and from Llanfihangel-y-Traethau (Merioneth)."

The authors also record this species from four stations off the West Coast of Scotland, very rare and also rare at three stations off South Cornwall, England, as well as rare at Plymouth, England.

Heron-Allen and Earland also record the species from the Antarctic [10] and from Lord Howe Island in the Pacific,[11] but do not figure specimens.

The figures given here are after the type figures of the Clare Island paper.

DISCORBIS BERTHELOTI (d'Orbigny)

Plate 3, figures 2 *a–c*

Rosalina bertheloti d'Orbigny, in Barker Webb and Berthelot, Hist. Nat. Iles Canaries, 1839, vol. 2, pt. 2, "Foraminifères," p. 135, pl. 1, figs. 28–30 [*berthelotiana* on explanation of plate].

Discorbina bertheloti H. B. Brady, Trans. Linn. Soc. Zool., vol. 24, 1864, p. 469, pl. 48, fig. 10; Ann. Mag. Nat. Hist., ser. 5, vol. 8, 1881, p. 413; Denkschr. Kais. Akad. Wiss. Math.-Nat. Cl., vol. 43, 1881, p. 16; Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 650, pl. 89, figs. 10–12.—Balkwill and Wright, Trans. Roy. Irish Acad., vol. 28, Sci., 1885, p. 350.—H. B. Brady, Parker, and Jones, Trans. Zool. Soc., vol. 12, 1888, p. 227, pl. 46, figs. 7, 8.—Halkyard, Trans. Manchester Micr. Soc., 1889, p. 69.—Chaster, First Rep't Southport Soc. Nat. Sci., 1890–91 (1892), p. 65.—Wright, Proc. Roy. Irish Acad., ser. 3, vol. 1, 1891, p. 490.—Silvestri, Mem. Accad. Pont. Nuovi Lincei, vol. 9, 1893, p. 212.—Egger, Abhandl. kön. bay. Akad. Wiss. München, Cl. II, vol. 18, 1893, p. 387, pl. 15, figs. 10–12.—Silvestri, Atti Accad. Sci. Acireale, vol. 7, 1896, p. 78.—Flint, Rept. U. S. Nat. Mus., 1897 (1899), p. 327, pl. 72, fig. 4.—Chapman, Journ. Linn. Soc. Zool., vol. 28, 1902, p. 405 (list).—Millett, Journ. Roy. Micr. Soc., 1903, p. 702.—Earland, Journ. Quekett Micr. Club, ser. 2, vol. 9, 1905, p. 223.—Goddard, Rec. Australian Mus., vol. 6, 1905–08 (1908), p. 309.—Rhumbler, Zool. Jahrb., Abt. Syst., vol. 24, 1906, p. 70.—Chapman, Journ. Quekett Micr. Club, ser. 2, vol. 10, 1907, p. 135.—Millett, Rec. Foram. Galway, 1908, p. 6.—Chapman, Subantarctic Islands of New Zealand, 1909. p. 356.—Sidebottom, Mem. Proc. Manchester Lit. Philos. Soc., vol. 54, No. 16, 1910, p. 26.—Heron-Allen and Earland, Proc. Roy. Irish Acad., vol. 31, pt. 64, 1913, p. 129; Trans. Linn. Soc. London, ser. 2, vol. 11, 1916, p. 273; Journ. Roy. Micr. Soc., 1916, p. 50.—Sidebottom, Journ. Roy. Micr. Soc., 1918, p. 253.—Heron-Allen and Earland, British Antarctic Exped., Zoology, vol. 6, 1922, p. 202.—Yabe and Hanzawa, Jap. Journ. Geol. Pal., vol. 4, 1925 (1926), p. 52.

Discorbis bertheloti Cushman, Bull. 71, U. S. Nat. Mus., pt. 5, 1915, p. 20, pl. 7, fig. 3; Proc. U. S. Nat. Mus., vol. 56, 1919, p. 625; Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 305, pl. 59, figs. 1 *a–c*.—Casasnovas, Not. Y Res. Instit. Esp. Ocean, ser. 2, No. 29, 1928, p. 7.

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[10] British Antarctic Exped., Zoology, vol. 6, 1922, p. 200.

[11] Journ. Linn. Soc. Zool., vol. 35, 1924, p. 631.

Discorbina berthelotiana GOËS, Kongl. Svensk. Vet. Akad. Handl., vol. 19, No. 4, 1882, p. 107, pl. 8, figs. 266–268; vol. 25, No. 9, 1894, p. 93, pl. 15, fig. 790; Bull. Mus. Comp. Zoöl., vol. 29, 1896, p. 69.—KIAER, Rept. Norwegian Fish. and Mar. Invest., vol. 1, No. 7, 1900, p. 45.

Discorbina turbo, var. *parisiensis*, subvar. *berthelotiana* PARKER and JONES, Philos. Trans., vol. 155, 1865, p. 387, pl. 16, figs. 26, 27.

Test plano-convex, oval, much compressed, scalelike, peripheral margin acute, sometimes slightly carinated, dorsal surface nearly flat, ventral side somewhat convex; chambers five to seven in the final whorl, often somewhat carinate at the border; sutures slightly depressed, distinct; wall smooth, finely perforate; aperture a narrow slit at the inner margin of the chamber on the ventral side.

Diameter, 0.40–0.80 mm.

d'Orbigny originally described this species from the Canary Islands. There are very many records from the region of the British Isles and western Europe, and some from many other regions, but as they are not usually accompanied by figures, it is very difficult to know whether or not they are identical with the Atlantic species.

A copy of the type figure is given here.

DISCORBIS BERTHELOTI (d'Orbigny), var. FLORIDENSIS, new variety

Plate 3, figures 3–5

Test broad, especially in the adult, plano-convex, whole test very strongly compressed, periphery keeled; chambers, four or five in the final whorl, rapidly increasing in size in the adult, broad, extending to nearly half of the periphery, on the ventral side with an angular projection over the umbilical region; sutures very distinct, depressed, slightly limbate; wall smooth, finely perforate, on the dorsal side evenly perforate, on the ventral the inner portion of each chamber clear and apparently without perforations; aperture low, elongate, at the base of the last-formed chamber.

Discorbis bertheloti, var. *floridensis*—*Material examined*

Cat. No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
12883	J.A.C.	1	----------	Off Turtle Harbor, Fla	40	-----	--------------	Rare.
12884	J.A.C.	1	----------	Off Ragged Key, Fla	75	-----	--------------	Do.
21191	U.S.N.M.	4	----------	Off Ragged Reef, Fla	70	-----	--------------	Few.
12885	J.A.C.	3	----------	do	85	-----	--------------	Rare.
21192	U.S.N.M.	2	----------	do	85	-----	--------------	Do.
12886	J.A.C.	1	----------	do	71	-----	--------------	Do.
21193	U.S.N.M.	1	----------	Off Government Cut, Miami, Fla.	30	-----	--------------	Do.
21194	U.S.N.M.	6	----------	Off Ajax Reef, Fla	40	-----	--------------	Few.
12887	J.A.C.	1	----------	Off Miami, Fla	20	-----	--------------	Rare.
12888	J.A.C.	4	----------	Off Fowey, Fla	22	-----	--------------	Few.
21195	U.S.N.M.	7	----------	do	22	-----	--------------	Common
21196	U.S.N.M.	1	----------	do	22	-----	--------------	Do.
12889	J.A.C.	1	----------	do	28	-----	--------------	Rare.
21197	U.S.N.M.	1	----------	do	28	-----	--------------	Do.
21198	U.S.N.M.	1	----------	do	40	-----	--------------	Do.

Discorbis bertheloti, var *floridensis*—*Material examined*—Continued

Catalogue No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
12890	J.A.C.	4	----------	Off Fowey, Fla----------	52	------	--------------	Few.
12891	J.A.C.	3	----------	-----do------------------	52	------	--------------	Do.
12892	J A.C.	1	----------	-----do------------------	55	------	--------------	Rare.
12893	J.A.C.	1	----------	-----do------------------	60	------	--------------	Do.
12894	J.A.C.	1	----------	-----do------------------	60	------	--------------	Do.
21199	U.S.N.M.	3	----------	-----do------------------	65	------	--------------	Do.
21200	U.S.N.M.	7	----------	-----do------------------	68	------	--------------	Common.
12895	J.A.C.	1	----------	-----do------------------	70	------	--------------	Rare.
21201	U.S.N.M.	2	----------	-----do------------------	70	------	--------------	Do.
21202	U.S.N.M.	1	----------	-----do------------------	70	------	--------------	Do.
12896	J.A.C.	1	----------	Nantasket Beach, Mass---	-------	------	--------------	Do.
			Albatross	° ′ ″ ° ′ ″				
21203	U.S.N.M.	2	D2311--	32 55 00 N.; 77 54 00 W---	79	59.1	Crs. s., bk. sp.	Do.
21204	U.S.N.M.	1	D2358---	20 19 00 N.; 87 03 30 W---	222	------	fne. wh. co--	Do.
21205	U.S.N.M.	1	D2614---	34 09 00 N.; 76 02 00 W---	168	------	gy. s., bk. sp	Do.

Diameter up to slightly more than 1 mm.

Holotype of variety (Cushman Coll. No. 12889) from 28 fathoms off Fowey Light, Fla. The species is a common one along the Florida coast and is probably widely distributed in the general West Indian region.

This variety is close to that referred by various authors to *Discorbis berthelotiana* (d'Orbigny), var. *baconica* (Hantken). Hantken's species from the *Clavulina Szaboi* beds of Hungary is not the same as this, as a comparison of the original figure and topotype material shows.

Our variety is an attached form, and numerous attached specimens are in our collection.

Egger records "*Discorbina baconica* Hantken" from off West Africa.

Flint's specimens from off Florida referred to "*Discorbina globularis*" [12] belong here.

DISCORBIS BICONCAVA (Parker and Jones)

This is an Indo-Pacific, almost Australian species. In the *Challenger* report (p. 653) Brady mentions that Siddall has very small specimens from the Estuary of the Dee that seem to belong here. Just what these are can not be determined without seeing the original specimens. Siddall later recorded these.[13] Flint records this same species,[14] but this is a West Indian *Planulina* that is taken up under that genus.

It should be noted that there are probably two distinct forms figured by Brady, and that one of them at least should be included under *Planulina*.

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[12] Ann. Rept. U. S. Nat. Mus., 1897 (1899), p. 327, pl. 72, fig. 2.

[13] Proc. Lit. Philos. Soc. Liverpool, 1886, p. 70 (list).

[14] Rept. U. S. Nat. Mus., 1897 (1899), p. 327, pl. 72, fig. 5.

DISCORBIS CANDEIANA (d'Orbigny)

Plate 7, figures 4 *a–c*

Rosalina candeiana D'ORBIGNY, in De la Sagra, Hist. Fis. Pol. Nat. Cuba, 1839, "Foraminifères," p. 97, pl. 4, figs. 2–4.

Truncatulina candeiana CUSHMAN, Proc. U. S. Nat. Mus., vol. 59, 1921, p. 57, pl. 13, figs. 4, 5; Publ. 311, Carnegie Instit. Washington, 1922, p. 47, pl. 6, figs. 7–9; Publ. 344, 1926, p. 78.

Truncatulina cora CUSHMAN (not d'Orbigny), Publ. 311, Carnegie Instit. Washington, 1922, p. 48, pl. 7, figs. 3–5.

Test trochoid, composed of about 2.5 coils, the last-formed coil composed of about six chambers, rapidly increasing in size, inflated; periphery rounded, lobulated; sutures depressed, except in the early part of the test, ventrally somewhat umbilicate, concave; wall coarsely perforate, the opening of each perforation small and surrounded by a ring of whitish thickened shell material, the remainder of the wall translucent; aperture, a narrow, arched slit at the base of the last-formed chamber with a slight lip; color of the early portion dark reddish-brown, becoming lighter, and the last few chambers white.

Diameter usually not exceeding 0.4 mm.

This is a very common species in the West Indian region in comparatively shallow water. Some of the attached specimens flatten and spread out and resemble in outline the form described by d'Orbigny as "*Rosalina cora.*" Except for this spreading due to attachment there is little variation, and the species is easily distinguished in West Indian material.

Discorbis candeiana—Material examined

Cat. No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
2860	J.A.C.	7	4	Dry Tortugas, Fla	1	------	dead coral	Few.
2867	J.A.C.	1	6	do	1	------	m	Rare.
2866	J.A.C.	4	8	do	1	------	m	Few.
2865	J.A.C.	3	10	do	11	23.2C.	s	Rare.
2864	J.A.C.	7	12	do	7	23 C	hrd	Common.
2861	J.A.C.	4	13	do	11	------	fne. s	Few.
2862	J.A.C.	8	14	do	12	------	fne. s	Common.
2863	J.A.C.	2	18	do	7	------	fne. s	Rare.
2869	J.A.C.	5	19	do	5.75	------	fne. s	Few.
2868	J.A.C.	7	20	do	7	------	fne. s	Common.
2881	J.A.C.	3	21	do	6	------	fne. s	Rare.
2871	J.A.C.	7	21	do	6	------	fne. s	Common.
2870	J.A.C.	10+	22	do	6	------	fne. s	Abundant.
2858	J.A.C.	3	22	do	6	------	fne. s	Rare.
2872	J.A.C.	3	27	do	7	------	m	Do.
2874	J.A.C.	3	28	do	4.75	------	fne. s	Few.
2880	J.A.C.	3	28	do	4.75	------	fne. s	Do.
2875	J.A.C.	6	37	do	11	------	fne. s	Do.
2859	J.A.C.	1	42	do	18	------	s	Rare.
12921	J.A.C.	6	----------	Off Miami, Fla	20	------	-------------	Few.
21215	U.S.N.M.	1	----------	Off Biscayne Bay, Fla	16–34	------	-------------	Rare.
12922	J.A.C.	1	----------	Off Miami, Fla	6	------	-------------	Do.
21216	U.S.N.M.	1	----------	Off Fowey, Fla	55	------	-------------	Do.
2876	J.A.C.	2	1	San Juan Harbor, Porto Rico.	5	------	-------------	Do.
2877	J.A.C.	1	----------	Montego Bay, Jamaica	9	------	-------------	Do.
			Albatross	° ′ ″ ° ′ ″				
21217	U.S.N.M.	1	D2352	22 35 00 N.; 84 23 00 W	463	45	nh. co	Do.
21218	U.S.N.M.	10+	D2358	20 19 00 N.; 87 03 30 W	222	------	fne. nh. co	Abundant.
21219	U.S.N.M.	2	D2388	29 24 30 N.; 88 01 00 W	35	------	yl. s., bk. sp.	Rare.

DISCORBIS CHASTERI (Heron-Allen and Earland)

Plate 4, figures 1–4

Discorbina minutissima Chaster (not Seguenza), First Rept. Southport Soc. Nat. Sci., 1890–91 (1892), p. 65, pl. 1, fig. 15.

Discorbina chasteri Heron-Allen and Earland, Proc. Roy. Irish Acad., vol. 31, pt. 64, 1913, p. 128, pl. 13, figs. 1–3; Trans. Linn. Soc. London, ser. 2, vol. 11, 1916, p. 272; Journ. Roy. Micr. Soc., 1916, p. 50.

Discorbis chasteri—Material examined

Cat. No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
			Goldseeker					
12803	J.A.C.	2	16	Off Faroe Ids				Abundant
12804	J.A.C.	10+	16	do				Do.
12805	J.A.C.	5	16	do				Do.

Test minute, subglobular, periphery broadly rounded, circular or oval in outline, last-formed whorl typically of but four chambers, inflated; sutures very distinct, somewhat depressed, those on the dorsal side curved, on the ventral side nearly radial; wall very smooth, very finely perforate, the wall appearing clear and transparent, on the umbilical side with fine lines radiating from the open umbilicus; aperture opening into the umbilical cavity.

Diameter 0.08–0.14 mm.; breadth 0.05–0.08 mm.

This small but distinctive species occurs about the British Isles, and I have a very fine set of them from *Goldseeker* Station 16 off Faroe Islands, 62° N.; 6° 12′ W. in 128 meters, kindly sent me by Earland. Two of these are drawn on our plate as well as a copy of the original figures. The species has been recorded also by the original authors from the Kerimba Archipelago off the southeastern coast of Africa, and from the Antarctic, a very unusual distribution if these are really all the same.

DISCORBIS CHASTERI (Heron-Allen and Earland), var. BISPINOSA (Heron-Allen and Earland)

Plate 4, figures 5, 6

Discorbina chasteri Heron-Allen and Earland, var. *bispinosa* Heron-Allen and Earland, Proc. Roy. Irish Acad., vol. 31, pt. 64, 1913, p.129, pl. 13, fig. 4; Trans. Linn. Soc. London, ser. 2, vol. 11, 1916, p. 273; Journ. Roy. Micr. Soc., 1916, p. 50.

Variety differing from the typical in the development of spines from the periphery of the chambers, progressively increasing in number from one to three.

Specimens of this interesting variety are in my collection through the kindness of Earland. They are from *Goldseeker* Station 16, with the typical. Some of the specimens show the progressive development of spines from one to three, two being the usual number on the adult chamber. It is recorded from the Clare Island region of Ireland; west of Scotland and South Cornwall. Sidebottom records it from off Australia, but his figure seems to show a keeled specimen rather than one with broadly rounded periphery.

DISCORBIS CONCINNA H. B. Brady (?)

This species originally described from the Indo-Pacific and apparently from later records limited to that faunal region, has been recorded from the Atlantic off the Cape Verde Islands by Egger[15], and by Hofker[16] from the coast of Holland. Hofker's figures are not at all like the few chambered species of Brady, and so it is very unlikely that *D. concinna* really occurs as an Atlantic species.

DISCORBIS FLORIDANA Cushman

Plate 4, figures 7, 8

Discorbis floridana Cushman, Publ. 311, Carnegie Instit. Washington, 1922, p. 39, pl. 5, figs. 11, 12.

Test rotaliform, periphery slightly, if at all, lobulated, dorsal side rounded, much convex, ventral side concave, somewhat umbilicate; chambers comparatively few, five or six in the last-formed coil, on the dorsal side coarsely punctate, on the ventral side punctate near the periphery, but on the inner concave portion smooth, with very fine punctae, if any; sutures in the younger portion slightly limbate, those of the later portion not limbate, rather indistinct, very slightly depressed; aperture an elongate, arched opening at the base of the last-formed chamber, opening on the umbilicate area, often with a slight, thin lip; color of the early whorls brown, of the last whorl white.

Diameter not exceeding 0.4 mm.

Discorbis floridana—Material examined

Cat. No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
2680	J.A.C.	2	4	Dry Tortugas, Fla	1	------	dead coral	Rare.
2685	J.A.C.	2	10	do	11	------	s	Do.
2681	J.A.C.	6	14	do	12	------	fne. s	Few.
2684	J.A.C.	3	21	do	6	------	fne. s	Rare.
2678	J.A.C.	1	22	do	6	------	fne. s	Do.
2683	J.A.C.	4	22	do	6	------	fne. s	Few.
2682	J.A.C.	2	28	do	4.75	------	fne. s	Rare.
2679	J.A.C.	2	37	do	11	------	fne. s	Do.
2686	J.A.C.	2	37	do	11	------	fne. s	Do.
12897	J.A.C.	3	------	Montego Bay, Jamaica	------	------	------	Do.

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[15] Abhandl. kön. bay. Akad. Wiss. München, Cl. II, vol. 18, 1893, p. 388, pl. 15, figs. 22–24.

[16] Flora en Fauna des Zuiderzee, Protozoa, 1922, p. 153, fig. 51 (in text).

This species is only known from the Tortugas region where it is fairly common, occurring at several stations. It also occurs in material from Montego Bay, Jamaica, and is probably widely distributed in the West Indian region. The specimens have a beautiful brown color with a translucent wall. The umbilical ends of the chambers are very clear and transparent.

DISCORBIS GLOBULARIS (d'Orbigny)

Plate 4, figures 9 *a–c*

Rosalina globularis d'Orbigny, Ann. Sci. Nat., vol. 7, 1826, p. 271, pl. 13, figs. 1, 2, Modèles, No. 69.

Discorbina globularis Carpenter, Parker, and Jones, Introd. Foram., 1862, p. 204, pl. 3, fig. 1.—H. B. Brady, Trans. Linn. Soc. Zool., vol. 24, 1864, p. 473 (table); Nat. Hist. Trans. Northumberland and Durham, vol. 1, 1865 (1867), p. 104; Ann. Mag. Nat. Hist., ser. 4, vol. 6, 1870, p. 64; Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 643, pl. 86, figs. 8, 13.—Balkwill and Wright, Trans. Roy. Irish Acad., vol. 28, Sci., 1885, p. 349.—Siddall, Proc. Lit. Phil. Soc. Liverpool, 1886, p. 70 (list).—Halkyard, Trans. Manchester Micr. Soc., 1889, p. 69.—Chaster, First Rept. Southport Soc. Nat. Sci., 1890–91 (1892), p. 65.—Wright, Proc. Roy. Irish Acad., ser. 3, vol. 1, 1891, p. 489.—Woodward, The Observer, vol. 4, 1893, p. 176.—Egger, Abhandl. kön. bay. Akad. Wiss. München, Cl. II, vol. 18, 1893, pl. 15, figs. 7–9.—Goës, Kongl. Svensk. Vet. Akad. Handl., vol. 25, No. 9, 1894, p. 94, pl. 15, fig. 793.—Mills, Trans. Hull. Sci. Field Nat. Club, vol. 1, 1900, p. 150, pl. 11, fig. 34.—Wright, Irish Nat., 1900, p. 55.—Kiaer, Rept. Norwegian Fish. and Mar. Invest., vol. 1, No. 7, 1900, p. 45.—Earland, Journ. Quekett Micr. Club, ser. 2, vol. 9, 1905, p. 220.—Millett, Rec. Foram. Galway, 1908, p. 6.—Heron-Allen and Earland, Proc. Roy. Irish Acad., vol. 31, pt. 64, 1913, p. 126; Trans. Linn. Soc. London, ser. 2, vol. 11, 1916, p. 272; Journ. Roy. Micr. Soc., 1916, p. 50.

Discorbina turbo, var. *globularis* Parker and Jones, in Carpenter, Introd. Foram., 1862, Appendix, p. 311.

Discorbina turbo, var. *vesicularis*, subvar. *globularis* Parker and Jones, Philos. Trans., vol. 155, 1865, p. 386, pl. 14, figs. 22, 23.

Test compressed, plano-convex, dorsal side slightly convex, ventral side flattened or slightly concave, periphery rounded; chambers distinct, usually five in the last-formed whorl, gradually and uniformly increasing in size as added, somewhat overlapping on the ventral side; sutures distinct, slightly depressed, gently curved; wall coarsely perforate on the dorsal side, finely so on the ventral; aperture narrow toward the umbilicus beneath the somewhat extended portion of the inner end of the chamber.

Diameter up to 0.85 mm.

This is a common species especially about the British Isles and western Europe, and there are many records as noted above. There are comparatively few records from other regions, and they are not included here. Some of the figured specimens from the Indo-Pacific show that they are not the same as the North Atlantic species.

Discorbis globularis—Material examined

Cat. No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
12899	J.A.C.	1		Dogs Bay, Ireland			s	
12900	J.A.C.	1		do			s	Common.
12901	J.A.C.	9		do			s	Do.
12902	J.A.C.	10+		Off Plymouth, England				Abundant.
13140	J.A.C.	1	*Flying Falcon* Log. 8	10 mi. S. of Glencoe, Ireland.	53			Rare.
12904	J.A.C.	6	*Goldseeker*	North Sound, Orkney Islands.				Common.
21206	U.S.N.M.	7	do	do				Do.
12903	J.A.C.	6	do	58° 52′ 00″ N.; 1° 37′ 00″ W.				Few.
21207	U.S.N.M.	5	do	58° 52′ 00″ N.; 1° 37′ 00″ W.				Do.

DISCORBIS GLOBULARIS (d'Orbigny), var. ANGLICA, new variety

Plate 4, figures 10 *a–c*

Discorbina irregularis HERON-ALLEN and EARLAND (not Rhumbler), Proc. Roy. Irish Acad., vol. 31, pt. 64, 1913, p. 120, pl. 10, figs. 2–4; Journ. Roy. Micr. Soc., 1916, p. 50.

Variety differing from the typical in having the later chambers much expanded and irregular.

Holotype of variety (Cushman Coll. No. 12809) from *Goldseeker* dredging, 3 miles off Nose Head, Moray Firth, 69 meters.

This form recorded by Heron-Allen and Earland is apparently definitely related to *D. globularis* so far as our specimens show, and seems to be different from Rhumbler's species from Laysan.

DISCORBIS MAMILLA (Williamson)

Plate 5, figures 1 *a–c*

Rotalina mamilla WILLIAMSON, Rec. Foram. Gt. Britain, 1858, p. 54, pl. 4, figs. 109–111.

Discorbina mamilla HERON-ALLEN and EARLAND, Proc. Roy. Irish Acad., vol. 31, pt. 64, 1913, p. 123, pl. 11, figs. 4–6; Trans. Linn. Soc. London, ser. 2, vol. 11, 1916, p. 271; Journ. Roy. Micr. Soc., 1916, p. 50; 1930, p. 183.

Test plano-convex, spire low but definite, sides nearly straight or slightly convex, periphery subacute, slightly lobulate; chambers distinct, usually five in the last-formed whorl, regularly increasing in size, slightly overlapping on the ventral side; sutures distinct, flush with the surface on the dorsal side, ventrally somewhat depressed, strongly curved; wall very coarsely perforate, otherwise smooth, the periphery thickened into a rounded keel with coarse tubulations; aperture ventral, near the umbilicus.

Diameter about 0.35 mm.

This species originally described by Williamson is recorded from several stations about the British Isles as well as from the Mediterranean and Kerimba, but the specimens from the latter locality are not figured, and are so widely removed from the British area that they may prove quite likely to belong elsewhere. I have abundant specimens from the *Lord Bandon* dredgings, Log. 39 in 20 fathoms, Lough Hyne, off County Cork, Ireland, sent me by Joseph Wright. These were evidently attached forms, and show much variation in the height of the spire, but the main characters are very constant.

Discorbis mamilla—Material examined

Cat. No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
12898	J.A.C.	10+	*Lord Bandon* Log. 39	Lough Hyne, off Cork, Ireland.	20	------	--------------	Abundant.

DISCORBIS MEDITERRANENSIS (d'Orbigny)

Plate 5, figures 2 *a–c*

Rosalina mediterranensis D'ORBIGNY, Ann. Sci. Nat., vol. 7, 1826, p. 271, No. 2.

Discorbina mediterranensis FORNASINI, Mem. Accad. Sci. Istit. Bologna, ser. 6, vol. 3, 1906, p. 61, pl. 1, fig. 1.—HERON-ALLEN and EARLAND, Proc. Roy. Irish Acad., vol. 31, pt. 64, 1913, p. 118, pl. 9, figs. 12–14; pl. 10, fig. 1; Trans. Linn. Soc. London, ser. 2, vol. 11, 1916, p. 272; Journ. Roy. Micr. Soc., 1916, p. 50.

This species has been recorded from about the British Isles by Heron-Allen and Earland in the above references. They also include other areas of the Pacific, but no figures are given.

Our figures are after Heron-Allen and Earland.

DISCORBIS MILLETTII (Wright)

Plate 5, figures 3, 4

Discorbina millettii WRIGHT, Rep't. Belfast Nat. Field Club, ser. 2, vol. 3, No. 6, Appendix No. 2, 1910–11 (1911), p. 13, pl. 2, figs. 14–17.—HERON-ALLEN and EARLAND, Proc. Roy. Irish Acad., vol. 31, pt. 64, 1913, p. 121, pl. 10, figs. 5–7; Trans. Linn. Soc. London, ser. 2, vol. 11, 1916, p. 270; Journ. Roy. Micr. Soc., 1916, p. 50; 1930, p. 182.

Wright originally described this species from off the Irish coast and also as a Pleistocene fossil. The records of Heron-Allen and Earland from the British Isles are Clare Island region of Ireland, Moray Firth, west of Scotland, off South Cornwall and off Plymouth.

The species seems to be best characterized by the rows of fine beads arranged in radial lines on the ventral side of the test. The figures given here are copied from the type figures given by Wright. It has not occurred in the western Atlantic material.

Our figured specimen is from the coast of Belgium and is close to this species in the ventral and side views, but has the chambers more overlapping in dorsal view.

It is very close to *Discorbis nitida* (Williamson) except on the ventral side.

DISCORBIS MIRA Cushman

Plate 5, figures 5, 6 *a–c*

Discorbis turbo H. B. Brady (and subsequent authors; not d'Orbigny), Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 642, pl. 87, figs. 8 *a–c*.

Discorbis mira Cushman, Publ. 311, Carnegie Instit. Washington, 1922, p. 39, pl. 6, figs. 10, 11; Publ. 344, 1926, p. 77.

Discorbis mira—Material examined

Cat. No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
2704	J.A.C.	1	6	Dry Tortugas, Fla	1		m	Common.
2691	J.A.C.	3	6	do	1		m	Do.
2689	J.A.C.	1	6	do	1		m	Do.
2690	J.A.C.	3	8	do	1		m	Do.
2698	J.A.C.	3	9	do	1		m	Few.
2770	J.A.C.	2	12	do	7		hrd	Do.
2699	J.A.C.	7	13	do	11		fne. s	Do.
2695	J.A.C.	5	14	do	12		fne. s	Do.
2696	J.A.C.	2	18	do	7		fne. s	Rare.
2703	J.A.C.	3	19	do	5.75		fne. s	Do.
2702	J.A.C.	3	20	do	7		fne. s	Do.
2693	J.A.C.	6	21	do	6		fne. s	Few.
2688	J.A.C.	2	22	do	6		fne. s	Do.
2705	J.A.C.	6	22	do	6		fne. s	Do.
2692	J.A.C.	1	27	do	7		m. s	Do.
2697	J.A.C.	10+	28	do	4.75		fne. s	Abundant.
2694	J.A.C.	3	37	do	11		fne. s	Rare.
21208	U.S.N.M.	1		Off Fowey, Fla	45			Do.
21209	U.S.N.M.	8		Off Biscayne Bay, Fla	16–34			Common.
12907	J.A.C.	2		Inside Reef, Key West, Fla.	3			Rare.
2753	J.A.C.	1		Featherbed Banks, Biscayne Bay, Fla.				Do.
2701	J.A.C.	10+	4	Largo Shoal, San Juan Harbor, P. R.	1			Abundant.
2706	J.A.C.	3	5	San Juan Harbor, P. R.	3			Rare.
2700	J.A.C.	1	8	do	2			Do.
6189	J.A.C.	3		Off Morro Castle, Havana, Cuba.				Do.
12908	J.A.C.	2		Montego Bay, Jamaica				Do.
			Albatross	° ′ ″ ° ′ ″				
21210	U.S.N.M.	1	D2358	20 19 00 N.; 87 03 30 W.	222		fne. wh. co	Do.
21211	U.S.N.M.	5	D2388	29 24 30 N.; 88 01 00 W.	35		yl. s., bk. sp.	Few.
21212	U.S.N.M.	2	D2629	23 48 40 N.; 75 10 40 W.	1,169	38.4	co. s	Rare.
21213	U.S.N.M.	4	D2755	8 04 00 N.; 52 47 00 W.	720	40	bv. m	Few.
12928	J.A.C.	3		Bermuda				Rare.

Test plano-convex, dorsal side forming a low cone, ventral side flattened and very slightly convex, trochoid, the last-formed whorl consisting of about six chambers; sutures oblique, curved very slightly, if at all, depressed on the dorsal side, on the ventral side depressed, the area thus formed often filled by alar prolongations from the center; periphery slightly lobulate, on the dorsal side the sutures often slightly limbate; the walls coarsely punctate, on the dorsal side irregularly so, the punctae near the outer margin of the chamber, less frequent elsewhere; aperture an elongate, slightly arched slit at the inferior margin of the chamber; color white.

Diameter up to 0.65 mm.

This is a common species in the West Indian region in shoal water. It is beautifully ornamented and is not likely to be mistaken for any other *Discorbis* of the western Atlantic. The young has a brownish color which is lost in the thickened adult test. It occurs fossil in the Miocene, Choctawhatchee marl of Florida.

The species is probably widely distributed in the Pacific like many of the West Indian species, and is probably recorded as "*Discorbina turbo*" following Brady's identification in the *Challenger* Report.

Brady's *Challenger* figures are of specimens from the Cape Verde Islands. He also records it from Bermuda and off the coast of Brazil. I have had it from numerous West Indian localities.

DISCORBIS NITIDA (Williamson)

Plate 6, figures 1 *a–c*

Rotalina nitida WILLIAMSON, Rec. Foram. Gt. Britain, 1858, p. 54, pl. 4, figs. 106–108.

Rotalia nitida H. B. BRADY, Trans. Linn. Soc. Zool., vol. 24, 1864, p. 474; Nat. Hist. Trans. Northumberland and Durham, vol. 1, 1865 (1867), p. 105.—BALKWILL and WRIGHT, Trans. Roy. Irish Acad., vol. 28, Sci., 1885, p. 352.—SIDDALL, Proc. Lit. Philos. Soc. Liverpool, 1886, p. 71.—HALKYARD, Trans. Manchester Micr. Soc., 1889, p. 71, pl. 2, fig. 12.—MILLETT, Rec. Foram. Galway, 1908, p. 7.

Discorbina nitida WRIGHT, Ann. Mag. Nat. Hist., ser. 6, vol. 4, 1889, p. 449; Proc. Roy. Irish Acad., ser. 3, vol. 1, 1891, p. 490.—CHASTER, First Rep't. Southport Soc. Nat. Sci., 1890–91 (1892), p. 65.—WRIGHT, Irish Nat., vol. 9, 1900, p. 55.—HERON-ALLEN and EARLAND, Proc. Roy. Irish Acad., vol 31, pt. 64, 1913, p. 121; Trans. Linn. Soc. London, ser. 2, vol. 11, 1916, p. 269, pl. 42, figs. 26–30; Journ. Roy. Micr. Soc., 1916, p. 49; 1930, p. 182.

Test plano-convex, making a low nearly symmetrical cone in side view, periphery subacute, with a narrow keel; chambers very distinct but not inflated, usually five or six in the last-formed whorl, very gradually and regularly increasing in size as added; sutures distinct, thickened on the dorsal side due to the keel of the chamber, strongly curved on the dorsal side, but not depressed, ventrally radial, slightly depressed; wall smooth throughout, very finely perforate; aperture at the base of the chamber near the umbilicus; color usually bluish-white.

Diameter up to 0.50 mm.; height of spine 0.15 mm.

This is a characteristic species of the European coast of the Atlantic, well figured by Williamson in 1858. Our figured specimen is from off the Belgian coast. The blue-white color is characteristic and the very smooth, translucent test.

Discorbis nitida—*Material examined*

Cat. No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
12905	J.A.C.	3	*Flying Falcon* Log. 8	10 miles south of Glencoe, Ireland.	53	------	--------------	Rare.
12906	J.A.C.	10+	*Goldseeker* 16	Off Faroe Islands--------	-------	------	--------------	Abundant.

DISCORBIS OBTUSA (d'Orbigny) (?)

Plate 6, figures 2 *a–c*

To this name Brady questionably refers a specimen from off Ascencion Island.[17] It somewhat resembles d'Orbigny's species from the Vienna Basin, but is very smooth. Numerous later records are given for *D. obtusa* from about the British Isles and in the North Atlantic. I have specimens from the American coast north of Cape Cod in the colder waters off New England that may be referred here, but it is not typical. It is, however, perhaps the same as the species of the North Atlantic and resembles d'Orbigny's figure, except in the smoother test and smaller perforations. As shown in Brady's figure, the earlier chambers and whorls are somewhat obscured.

Discorbis obtusa—*Material examined*

Cat. No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
12909	J.A.C.	1	------	Off High Head, Casco Bay, Me--	-------	------	--------------	Rare.
12910	J.A.C.	2	21	Casco Bay, Me------------------	-------	------	--------------	Do.
12911	J.A.C.	1	21	-----do------------------------	-------	------	--------------	Do.
12912	J.A.C.	2	------	Spar Landing, Frenchmans Bay, Me.	15	------	--------------	Do.
12913	J.A.C.	2	------	Hampton Beach, N. H.-----------	-------	------	--------------	Do.
12914	J.A.C.	4	------	Nahant Beach, Nahant, Mass----	-------	------	--------------	Few.
2763	J.A.C.	1	------	Dröbach, Norway----------------	-------	------	--------------	Rare.

DISCORBIS ORBICULARIS (Terquem)

Plate 6, figures 3 *a–c*

Rosalina orbicularis TERQUEM, Anim. sur la Plage de Dunkerque, 1876, p. 75, pl. 9, figs. 4, *a*, *b*.

Discorbis orbicularis BERTHELIN, Foram. de Borgneuf et Pornichet, 1878, p. 39, No. 63.—CUSHMAN, Bull. 71, U. S. Nat. Mus., pt. 5, 1915, p. 16, pl. 11, fig. 1; Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 305; Publ. 311, Carnegie Instit., Washington, 1922, p. 38, pl. 5, fig. 10.

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[17] *Challenger* Rep't., pl. 91, figs. 9 *a–c*.

Discorbina orbicularis H. B. BRADY, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 647, pl. 88, figs. 4–8.—BALKWILL and WRIGHT, Journ. Micr., vol. 3, 1884, p. 22, pl. 4, fig. 13.—SIDDALL, Proc. Lit. Philos. Soc. Liverpool, 1886, p. 70 (list).—H. B. BRADY, PARKER, and JONES, Trans. Zool. Soc. London, vol. 12, 1888, p. 227, pl. 46, fig. 1.—HALKYARD, Trans. Manchester Micr. Soc., 1889, p. 69.—CHASTER, First Rep't. Southport Soc. Nat. Sci., 1890–91 (1892), p. 65.—EGGER, Abhandl. kön. bay. Akad. Wiss. München, Cl. II, vol. 18, 1893, p. 389, pl. 15, figs. 16–18, 76–78.—WOODWARD, The Observer, vol. 4, 1893, p. 176.—SILVESTRI, Mem. Accad. Pont. Nuovi Lincei, vol. 9, 1893, p. 211; Atti Accad. Sci. Acireale, vol. 7, 1896, p. 78.—GOËS, Bull. Mus. Comp. Zoöl., vol. 29, 1896, p. 69.—WRIGHT, Irish Nat., vol. 9, 1900, p. 55.—CHAPMAN, Journ. Linn. Soc. Zool., vol. 28, 1902, pp. 191, 208, 405; Journ. Roy. Micr. Soc., 1903, p. 699.—EARLAND, Journ. Quekett Micr. Club, ser. 2, vol. 9, 1905, p. 221.—DAKIN, Rep't. Pearl Oyster Fish. Ceylon, 1906, p. 238.—MILLETT, Rec. Foram. Galway, 1908, p. 6, pl. 4, fig. 13.—SIDEBOTTOM, Mem. Proc. Manchester Lit. Philos. Soc., vol. 52, No. 13, 1908, p. 13, pl. 4, fig. 7; vol. 54, No. 16, 1910, p. 25.—HERON-ALLEN and EARLAND, Proc. Roy. Irish Acad., vol. 31, pt. 64, 1913, p. 126.—PEARCEY, Trans. Roy. Soc. Edinburgh, vol. 49, 1914, p. 1026.—HERON-ALLEN and EARLAND, Trans. Zool. Soc. London, vol. 20, 1915, p. 693.—CHAPMAN, Biol. Res. *Endeavour*, vol. 3, pt. 1, 1915, p. 29.—HERON-ALLEN and EARLAND, Trans. Linn. Soc. London, ser. 2, vol. 11, 1916, p. 271; Journ. Roy. Micr. Soc., 1916, p. 50; British Antarctic Exped., Zoology, vol. 6, 1922, p. 200; Bull. Soc. Sci. Hist. Nat. Corse, 1922, p. 135.

Discorbis orbicularis—Material examined

Catalogue No.	Collection of	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
2723	J.A.C.	3	4	Dry Tortugas, Fla.	1		dead coral	Rare.
2715	J.A.C.	4	6	do.	1		m	Few.
2716	J.A.C.	1	6	do.	1		m	Rare.
2711	J.A.C.	4	8	do.	1		m	Few.
2709	J.A.C.	1	10	do.	11		s	Rare.
2722	J.A.C.	2	12	do.	7	23°c	hrd	Do.
2721	J.A.C.	2	13	do.	11		fne. s	Do.
2718	J.A.C.	2	14	do.	12		fne. s	Do.
2719	J.A.C.	2	18	do.	7		fne. s	Do.
2714	J.A.C.	1	18	do.	7		fne. s	Do.
2710	J.A.C.	6	19	do.	5.75		fne. s	Few.
2720	J.A.C.	5	20	do.	7		fne. s	Do.
2712	J.A.C.	5	20	do.	7		fne. s	Do.
2713	J.A.C.	4	21	do.	6		fne. s	Do.
2761	J.A.C.	1	21	do.	6		fne. s	Do.
2707	J.A.C.	7	22	do.	6		fne. s	Common.
2708	J.A.C.	3	27	do.	7		m	Rare.
2717	J.A.C.	4	28	do.	4.75		fne. s	Few.
12915	J.A.C.	1		Key West, Fla.	3			Rare.
12916	J.A.C.	1		Montego Bay, Jamaica				Do.
2725	J.A.C.	1		do.	6		m. s	Do.
12927	J.A.C.	3		Bermuda				Do.

Test plano-convex, the dorsal side forming a low cone, ventrally flat or more often somewhat concave, circular in outline, periphery acute; chambers elongate, each often making nearly half of the circumference, distinct; sutures slightly depressed, distinct; wall finely to coarsely perforate, smooth; aperture ventral, an elongated opening beneath the somewhat extended central portion of the last-formed chamber.

Diameter up to 0.85 mm.

This species is apparently very widely distributed if one may take all the records without figures as referring to the same species. There are numerous forms both fossil and living which fit the general description given for this species. A study of these in detail will undoubtedly show that more than a single species is involved.

In the West Indian region such specimens as here described are not uncommon. The figured specimen is from off Jamaica. Brady's *Challenger* figures (pl. 88, fig. 4 *a–c*) represent a Bermuda specimen of the same form. His other figures for the Pacific show considerable differences.

DISCORBIS ORBICULARIS (Terquem), var. SELSEYENSIS (Heron-Allen and Earland)

Plate 7, figures 1 *a*, *b*.

Discorbina rosacea d'Orbigny, var. *selseyensis* Heron–Allen and Earland, Journ. Roy. Micr. Soc., 1911, p. 330, pl. 10, figs. 20, 21.

Variety differing from the typical in having radial corrugations on the ventral side.

This variety described from Recent material off Selsey Bill, Sussex, England evidently is a variety of *Discorbis orbicularis* (Terquem).

DISCORBIS PARISIENSIS (d'Orbigny) (?)

Plate 6, figures 5 *a-c*.

There are numerous records for this species living in the Atlantic and elsewhere. The typical form from the Eocene of the Paris Basin is a large very striking form, and seems to be decidedly different from most of the published figures of living specimens referred to it. The figured specimen is from off the coast of Belgium.

DISCORBIS PATELLIFORMIS H. B. Brady (?)

Egger records this species from the Cape Verde Islands. His figures are very much lacking in details, and as this is the only record for this typical Indo-Pacific species in the Atlantic, it is probably not this species.

DISCORBIS PERUVIANA d'Orbigny

To this South American Pacific species have been referred various specimens from the British Isles and elsewhere. The figures given however do not seem to be identical with that of d'Orbigny.

DISCORBIS PLANORBIS (d'Orbigny) (?)

It may be noted that Heron-Allen and Earland have under "*Discorbina planorbis* (d'Orbigny)" recorded high spired forms from the British Isles. I have examined much material of "*Asterigerina* *planorbis* d'Orbigny" from the type locality of the Vienna Basin, and it seems to be a true *Asterigerina*. It is moreover a rather low spired, broadly spreading species as figured in the Vienna Basin paper and in the topotype material. The high spired Recent form needs further study.

DISCORBIS POLYRAPHES (Reuss) (?)

Under the name "*Discorbina polyraphes*" Heron-Allen and Earland record a very small species from off the British Isles. Reuss's Cretaceous species with its rounded periphery and other characters seems to belong elsewhere than in *Discorbis*. Figures of the Recent British form are given by Heron-Allen and Earland.[18]

DISCORBIS (?) POLYSTOMELLOIDES (Parker and Jones) (?)

Hofker records "*Discorbina polystomelloides*" from Holland,[19] but his figure indicates that the species from western Europe is an *Elphidium*. The typical form figured by Brady and others from the Indo-Pacific is probably not a *Discorbis*, but may be related to *Epistomella*.

DISCORBIS (?) PRAEGERI (Heron-Allen and Earland)

Plate 6, figures 4 *a–c*

Discorbina praegeri HERON-ALLEN and EARLAND, Proc. Roy. Irish Acad., vol. 31, pt. 64, 1913, p. 122, pl. 10, figs. 8–10; Trans. Zool. Soc. London, vol. 20, 1915, p. 692; Trans. Linn. Soc. London, ser. 2, vol. 11, 1916, p. 270; Journ. Roy. Micr. Soc., 1916, p. 50; Bull. Soc. Sci. Hist. Nat. Corse, 1922, p. 134; British Antarctic Exped., Zool., vol. 6, 1922, p. 199; Journ. Roy. Micr. Soc., 1930, p. 183.

"Test free, trochoid and conical, composed of three to four convolutions, in a depressed spire, with five or six chambers in the last convolution. Peripheral edge entire and usually somewhat thickened, occasionally slightly carinate. Still more rarely the marginal edge is lobulate, owing to the slight inflation of the segments. Sutures flush on the superior face of the shell, somewhat depressed on the base or inferior face, which is nearly flat, and furnished in the umbilical region with a solid stud of shell-substance; breadth varies from 0.15 to 0.4 mm.

"This is one of the innumerable types of *D. rosacea;* but as it does not appear to have been specifically described, in spite of its very distinctive appearance, we have thought it advisable to give it a name. It is one of the most characteristic types of the Clare Island area, and occurs in more or less abundance in nearly every dredging, as also in many '*Goldseeker*' dredgings and other British gatherings. It can hardly be confused with any other type if examined from the under-surface, the solid umbilical stud being a constant feature.

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[18] Proc. Roy. Irish Acad., vol. 31, pt. 64, 1913, pl. 12, figs. 11–13.

[19] Flora en Fauna der Zuiderzee, Protozoa, 1922, p. 150, fig. 47 (in text).

"There is no doubt that Williamson was familiar with this form, but he failed to separate it from his *Rotalina nitida*, the description of which, as we have already pointed out under that form, appears to have been based on a series of allied specimens. He states that 'in some instances the inferior umbilicus is occupied by a distinct and prominent umbo.' These specimens were, no doubt, our *D. praegeri*. We have never seen any specimens of *D. nitida* presenting this feature, the nearest approach to it being the presence of a small tooth on each chamber projecting into the umbilical depression. By the coalescence of these teeth and a raising of the height of the spire, *D. nitida* passes into *D. praegeri*.

"We have much pleasure in associating this form with the name of Mr. R. Lloyd Praeger, but for whose perseverance and energy the authors would not have been induced to undertake and carry through their somewhat laborious task in connexion with the Clare Island Survey."

The above paragraphs and the figures are from the original paper of Heron-Allen and Earland. The form is somewhat of an anomaly with its ventral umbo and somewhat evolute test on the ventral side. The distribution as given is a peculiar one from the British Isles, Mediterranean, tropical shallow water of the Kerimba Archipelago of the Southeastern coast of Africa, and the cold water of the Antarctic. Such a distribution is indicated by Heron-Allen and Earland for many of their species of the Clare Island paper, including often shallow water tropical material from Lord Howe Island in the Pacific. Such a series probably indicates a very wide latitude in the definition of the various species.

"DISCORBINA ROSACEA (d'Orbigny)"

Under this name there are a great many records from the Atlantic and other regions. It has been a favorite "dumping ground" for numerous *Discorbis*-like forms. Of the many records for "*Discorbina rosacea*," there are very few which figure the species and practically none of these can be referred to the same species. d'Orbigny's "*Rotalia rosacea*" is from the Miocene of the Bordeaux region well represented by Model No. 39. It is very clearly an *Amphistegina* of the less complex type. I have abundant specimens of this species from several localities in the Bordeaux region through the kindness of Prof. G. Dollfuss, and they are uniformly a rather high-spired *Amphistegina*. The structure is rather too complex to place them in *Asterigerina* as was done later by d'Orbigny, although they show well the transition from one of these genera to the other.

It becomes impossible to use this species name for any of the many forms of *Discorbis* called by various authors "*rosacea*" and the problem of straightening out the various species involved can only be accomplished by a careful study of original material on which these records were based.

Brady's figures have undoubtedly been followed by many later authors. He has two species, one of which (pl. 8, fig. 1) is *Discorbis advena* Cushman. The other is an Indo-Pacific species common especially in the Australian region and unlike the western Atlantic forms which have been assigned to "*Discorbina rosacea.*"

DISCORBIS SUBARAUCANA Cushman

Plate 7, figures 2 *a–c*

Discorbis subaraucana Cushman, Publ. 311, Carnegie Instit. Washington, 1922, p. 41, pl. 7, figs. 1, 2; Publ. 344, 1926, p. 78.

Test unequally biconvex, dorsal side somewhat arched, the ventral side very slightly convex, flattened, or even somewhat concave; periphery not lobulated, composed of about 2.5 coils, six to eight chambers in the last-formed one; sutures oblique, curved, limbate on the dorsal side, except in the last two or three chambers in the adult, ventrally also somewhat limbate, especially in the early stages; wall with numerous punctae; aperture at the base of the ventral side of the last-formed chamber, narrow; color of the earlier chambers reddish-brown, those of the last-formed ones usually white.

Diameter up to 0.40 mm.

This species is common in the West Indian region, and extends up the coast of the United States in the warmer waters to south of Cape Cod. It is also probably widely distributed in the Indo-Pacific.

As a fossil it occurs in the Miocene, Choctawhatchee marl, of Florida.

Discorbis subaraucana—Material examined

Catalogue No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
2745	J.A.C.	3	6	Dry Tortugas, Fla	1		m	Few.
2744	J.A.C.	1	6	do	1		m	Do.
2737	J.A.C.	1	8	do	1		m	Rare.
2736	J.A.C.	5	12	do	7		hrd	Few.
2738	J.A.C.	4	13	do	11		fne. s	Do.
2739	J.A.C.	6	14	do	12		fne. s	Do.
2740	J.A.C.	6	18	do	7		fne. s	Do.
2742	J.A.C.	9	19	do	5.75		fne. s	Common.
2735	J.A.C.	9	20	do	7		fne. s	Do.
2747	J.A.C.	6	21	do	6		fne. s	Few.
2746	J.A.C.	4	22	do	6		fne. s	Do.
2743	J.A.C.	7	23	do	10.5		m. s	Do.
2741	J.A.C.	2	27	do	7		m	Rare.
2748	J.A.C.	5	28	do	4.75		fne. s	Few.
2734	J.A.C.	2	42	do	18		s	Rare.
12917	J.A.C.	1		Off Government cut, Miami, Fla.	30			Do.
12918	J.A.C.	1		Off Key West, Fla.	78			Do.
2749	J.A.C.	1	4	Largo Shoal, San Juan Harbor, P. R.	1			Do.
12919	J.A.C.	1		Newport Beach, Newport, R. I.				Do.
21214	U.S.N.M.	1	*Albatross* D2552	39° 47′ 07″ N.; 70° 35′ 00″ W	721	39.6	gy. oz	Do.

DISCORBIS TABERNACULARIS (H. B. Brady)

This species, characteristic of warm tropical waters of the Indo-Pacific, was recorded by Brady in the *Challenger* Report from off St. Vincent, Cape Verde Islands in 11 fathoms. Heron-Allen and Earland[20] record it from Selsey Bill, Sussex, England. I have a single specimen of a high spired form off Miami, Fla., that remotely resembles this species, but is not identical with it.

DISCORBIS VALVULATA (d'Orbigny)

Plate 7, figures 3 *a–c*

Rosalina valvulata D'ORBIGNY, Ann. Sci. Nat., vol. 7, 1826, p. 271, No. 4; in De la Sagra, Hist. Fis. Pol. Nat. Cuba, 1839, "Foraminifères," p. 103, pl. 3, figs. 21–23; in Barker-Webb and Berthelot, Hist. Nat. Iles. Canaries, 1839, "Foraminifères," p. 136, pl. 2, figs. 19–21.

Discorbina valvulata JONES and PARKER (?), Quart. Journ. Geol. Soc., vol. 28, 1872, p. 114.—GOËS, Kongl. Svensk. Vet. Akad. Handl., vol. 19, No. 4, 1882, p. 106, pl. 8, figs. 258–261.—WOODWARD, The Observer, vol. 4, 1893, p. 176.—GOËS, Bull. Mus. Comp. Zoöl., vol. 29, 1896, p. 69.

Discorbis valvulata CUSHMAN, Publ. 344, Carnegie Instit. Washington, 1926, p. 78.

Test longer than broad, plano-convex, spire very low and compressed, ventral side flattened or concave, periphery with a rounded keel; chambers distinct, increasing rather rapidly in size, on the ventral side with a distinct valvular lip over the umbilical region; sutures on the dorsal side somewhat thickened, not depressed, curved, ventrally sinuate; wall smooth, finely perforate; aperture elongate, narrow, below the valvular projection of the chamber near the umbilicus.

Length, 0.50 mm.; breadth, 0.30 mm.

In the West Indian region this is a well characterized species, but is not at all common although widely distributed. The somewhat thickened keel of the chambers, the elongate form and peculiar sutures of the ventral side will distinguish it.

It occurs fossil in the Miocene, Choctawhatchee marl, of Florida.

Discorbis valvulata—Material examined

Catalogue No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
2751	J.A.C.	2	1	San Juan Harbor, P. R	5	------	------	Rare.
2752	J.A.C.	2	5	do	3	------	------	Do.
12920	J.A.C.	1	------	Off Pocasset, Buzzards Bay, Mass.	------	------	------	Do.

DISCORBIS VESICULARIS Lamarck

Under this name there are numbers of records from the Atlantic. They are not identical so far as the figures show with the very beautiful species of the Paris Basin Eocene described by Lamarck, and which is a very definite and highly ornate species. On the coast of Australia is a species still living which is very close to the Eocene species of Lamarck, but the North Atlantic records as figured are not this.

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[20] Journ. Roy. Micr. Soc., 1911, p. 331.

DISCORBIS VILARDEBOANA (d'Orbigny)

This species with its rounded periphery was described and figured by d'Orbigny from the Falklands. It is not the same as the figures Brady assigns to it, and probably most of the Atlantic records are based upon Brady's figures rather than those of d'Orbigny, therefore they should be re-examined to find their exact specific relationships. Some of the records in the West Indies and Indo-Pacific are probably *Discorbis mira* Cushman.

Genus LAMARCKINA Berthelin, 1881

Lamarckina Berthelin, Comptes Rendus Assoc. France (Reims, 1880), 1881, p. 555.—Cushman, Special Publ. No. 1, Cushman Lab. Foram. Res., 1928, p. 271.

Megalostomina Rzehak, Ann. k. k. Nat. Hofmuseums, vol. 10, 1895, p. 228 (genoholotype, *Megalostomina fuchsi* Rzehak).

Pulvinulina (part) of Authors.

Rotalina (part) of Authors.

Discorbina (part) of Authors.

Valvulina (part) of Authors.

Genoholotype.—Pulvinulina erinacea Karrer.

Test trochoid, evidently attached, dorsal side convex, ventral side usually flattened or concave, dorsal side usually ornamented, ventral side very smooth and highly polished; chambers distinct on the dorsal side, less so on the ventral, each often with an umbilical projection; wall finely perforate, calcareous, ventral side thickened; aperture at the umbilical end of the chamber, often enlarged by resorption.

Upper Cretaceous to Recent.

Most of the species of this genus are fossil, but a very few are still found living in the present oceans. Of these, there seem to be four species in the Atlantic that can be referred to this genus. They have the open umbilicus and the elongation of the ventral side of the last-formed chamber together with the somewhat polished ventral side.

LAMARCKINA VENTRICOSA (H. B. Brady)

Plate 7, figures 5 *a–c*

Discorbina ventricosa H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 654, pl. 9, figs. 7*a–c*.

Lamarckina ventricosa Cushman, Contr. Cushman Lab. Foram. Res., vol. 2, 1926, p. 12.

"Test free, oblong, rounded, more or less depressed; composed of less than two complete convolutions, the outer whorl consisting of six or seven segments; the successive segments increasing rapidly in length; septal faces ventricose, especially that of the final chamber; sutures excavated. Superior face hispid externally, inferior smooth; umbilicus deeply sunk, valvular flaps but little developed. Diameter, about one-fiftieth inch (0.5 mm.)."

Brady described and figured this species from *Challenger* dredgings off Bermuda, 435 fathoms. His type figures are copied here. In addition he records it from off Gomera, Canaries, 620 fathoms; off the Azores, 450 fathoms; and off Raine Island, 155 fathoms.

There are a few other records for this species, but the figures where given do not seem to correspond well with those of Brady.

LAMARCKINA SCABRA (H. B. Brady)

Plate 7, figures 6 *a–c*

Pulvinulina oblonga Williamson, var. *scabra* H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 689, pl. 106, fig. 8.—Woodward, The Observer, vol. 4, 1893, p. 177.—Sidebottom, Mem. Proc. Manchester Lit. Philos. Soc., vol. 53, No. 21, 1909, p. 6, pl. 3, figs. 3, 4; vol. 54, No. 16, 1910, p. 27.—Heron-Allen and Earland, Trans. Zool. Soc. London, vol. 20, 1915, p. 714.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 5, 1915, p. 53, pl. 27, fig. 5.

Test unequally biconvex, dorsal side much flattened, ventral side more convex, peripheral margin acute, carinate; chambers seven or eight in the final whorl, rapidly increasing in size and length as added, on the ventral side the last-formed chamber in the adult taking up at least one-half the area of the test; sutures slightly depressed, limbate above and below; wall rugose or granular on the dorsal side, smooth below.

Diameter, 0.5 mm.

Brady's records for this species in the *Challenger* dredgings include a station off Bermuda in 435 fathoms and west of the Azores in 1,000 fathoms. It is recorded from the Indo-Pacific also. The figured specimen is after Brady, but is from the Pacific. I have had no typical specimens from the Atlantic, and none are figured.

LAMARCKINA ATLANTICA, new species

Plate 7, figures 7 *a–c*

Test slightly longer than broad, biconvex, ventral side the more strongly convex, umbilicate, periphery keeled and subacute; chambers rapidly increasing in size as added, the last-formed chamber on the ventral side making up nearly half the area of the test; sutures slightly limbate, slightly depressed on the dorsal side, more strongly so on the ventral side; wall very slightly roughened on the dorsal side, smooth and polished on the ventral side; aperture at the umbilical end of the chamber ventrally.

Length, 0.75 mm.; breadth, 0.60 mm.; height, 0.25 mm.

Holotype (Cushman Coll. No. 12924) from off the coast of Florida, off Fowey, 22 fathoms.

The species is smoother than the two preceding ones, but is related to them. It is comparatively broad.

Lamarckina atlantica—Material examined

Cat. No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
12924	J.A.C.	1	------	Off Fowey, Fla	22	------	--------------	Rare.

LAMARCKINA HALIOTIDEA (Heron-Allen and Earland)

Plate 7, figures 8, 9

Pulvinulina haliotidea Heron-Allen and Earland, Journ. Roy. Micr. Soc., 1911, p. 338, pl. 11, figs. 6–11; Proc. Roy. Irish Acad., vol. 31, pt. 64, 1913, p. 136; Journ. Roy. Micr. Soc., 1916, p. 51; Trans. Linn. Soc. London, ser. 2, vol. 11, 1916, p. 276; British Antarctic Exped., Zoology, vol. 6, 1922, p. 215; Journ. Roy. Micr. Soc., 1930, p. 189.

Test small, compressed, somewhat longer than broad, dorsal side gently convex, ventral side flattened or concave, umbilicate, periphery subacute; chambers distinct, usually five in the final whorl, the last one in the adult much the longest and on the ventral side extending backward in a large lobe; sutures distinct, only slightly curved, not much depressed; wall smooth, ventral side polished; aperture on the inner margin of the ventral side of the chamber.

Length, 0.35 mm.; breadth, 0.25–0.28 mm.; height, 0.06 mm.

This small but distinctive species seems to be well distributed on the coast of western Europe. I have an excellent series from a *Goldseeker* dredging off the Faroe Islands thanks to Earland. Very typical specimens occur off the coast of Belgium. Heron-Allen and Earland record it from *Goldseeker* stations from the Clare Island region of Ireland, off South Cornwall, and west of Scotland. They also record it from the Antarctic, but most of the specimens are recorded of much greater size than those of European waters.

Heron-Allen and Earland named this species on account of its ear-like shape, a characteristic of the ventral side of most species of *Lamarckina*.

It may be noted here that d'Orbigny's "*Valvulina excavata*" from off the Canaries figured in that report (pl. 1, figs. 43–45) is probably a *Lamarckina*.

Lamarckina haliotidea—Material examined

Cat. No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
12925 13141	J.A.C. J.A.C.	10+ 1	*Goldseeker* 16	° ′ ″ ° ′ ″ 62 00 00 N.; 6 12 00 W.				Abundant.

Genus VALVULINERIA Cushman, 1926

Valvulineria CUSHMAN, Contr. Cushman Lab. Foram. Res., vol. 2, 1926, p. 59; Special Publ. No. 1, Cushman Lab. Foram. Res., 1928, p. 271.

Rosalina (part) of AUTHORS.

Genoholotype.—Valvulineria californica Cushman.

Test usually trochoid, close coiled, all chambers of the several coils visible from the dorsal side, only those of the last-formed coil from the ventral side, umbilicate; chambers numerous; wall calcareous, finely perforate; aperture ventral, large, extending from the umbilical end of the chamber nearly to the periphery and covered by a thin, membrane-like plate which largely fills the umbilical area, in the adult the aperture often extending into the ventral or peripheral face of the chamber, sometimes becoming tripartite.

Cretaceous to Recent.

I have found no Atlantic material which can be definitely assigned to this genus.

Genus GYROIDINA d'Orbigny, 1826

Gyroidina D'ORBIGNY, Ann. Sci. Nat., vol. 7, 1826, p. 278.—CUSHMAN, Special Publ. No. 1, Cushman Lab. Foram. Res., 1928, p. 272.

Rotalina (part) of AUTHORS.

Genotype, by designation.—*Gyroidina orbicularis* d'Orbigny.

Test trochoid, usually with the ventral side convex, the umbilicus small and deep; chambers in the central region usually higher than the peripheral ones and separated by a depressed channel; wall calcareous, finely perforate; aperture, a low arched opening on the ventral side toward the umbilical area.

Lower Cretaceous to Recent.

This genus is abundant in some of the *Albatross* dredgings as the tables will show.

GYROIDINA ORBICULARIS d'Orbigny

Plate 8, figures 1, 2

Gyroidina orbicularis D'ORBIGNY, Ann. Sci. Nat., vol. 7, 1826, p. 278, No. 1; Modèles No. 13.—PARKER, JONES, and BRADY, Ann. Mag. Nat. Hist., ser. 3, vol. 16, 1865, p. 20, pl. 3, fig. 85.

Rotalia orbicularis H. B. BRADY, Trans. Linn. Soc. London, vol. 24, 1864, p. 470, pl. 48, fig. 16; Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 706, pl. 115, fig. 6 (?), (not pl. 107, fig. 5).—WRIGHT, Proc. Roy. Irish Acad., ser. 3, vol. 1, 1891, p. 492.—KIAER, Rep't. Norwegian Fish. Mar. Invest., vol. 1, No. 7, 1900, p. 48.—Wright, Irish Nat., vol. 9, 1900, p. 55.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 5, 1915, p. 69, pl. 29, fig. 30; text figs. 62*a–c*.—Heron-Allen and Earland, Trans. Linn. Soc. London, ser. 2, vol. 11, 1916, p. 277; Journ. Roy. Micr. Soc., 1916, p. 53.

Test unequally biconvex, dorsal side flattened or very slightly convex, umbonate in the middle, somewhat depressed toward the periphery, ventral side strongly convex, umbilicate, periphery subacute or at least not broadly rounded; chambers 8 to 12 in the last-formed whorl, distinct; sutures distinct, not depressed; wall smooth throughout; aperture, a narrow opening on the ventral edge of the chamber between the umbilicus and periphery.

d'Orbigny's model of this species shows a form with a subacute periphery and with the dorsal side slightly convex, highest in the middle, the umbilicus nearly closed. Such specimens occur in the Eastern Atlantic on the coast of Europe, but very few have been observed in the dredgings from the western side of the Atlantic, Flint's specimens recorded as this species not being the same. Authors subsequent to Brady's *Challenger* Report may have been misled by his figures, his Plate 107, fig. 5 as already noted by Heron-Allen and Earland [21] being a true *Rotalia*, probably the young of *R. beccarii*.

Gyroidina orbicularis—Material examined

Catalogue No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
21250	U.S.N.M.	2	*Albatross* D2003	37° 16′ 30″ N.; 14° 20′ 36″ W.	641			Rare.
21526	U.S.N.M.	3	*Goldseeker*	60 28 00 N.; 3 15 00 W.				Do.
21527	U.S.N.M.	2	do.	Off S. W. Ireland	620–695			Do.

GYROIDINA SOLDANII d'Orbigny

Plate 8, figures 3–8

Gyroidina soldanii d'Orbigny, Ann. Sci. Nat., vol. 7, 1826, p. 278, No. 5; Modèles No. 36.—Cushman, Bull. Scripps Instit. Oceanography, Tech. Ser., vol. 1, 1927, p. 162; Special Publ. No. 1, Cushman Lab. Foram. Res., 1928, pl. 39, fig. 13; pl. 41, fig. 7.—Church, Journ. Pal., vol. 1, 1928, p. 267.—Galloway and Morrey, Bull. Amer. Pal., vol. 15, 1929, p. 27, pl. 4, fig. 4.—Cushman, Contr. Cushman Lab. Foram. Res., vol. 5, 1929, p. 98, pl. 14, figs. 6, 7.

Rotalia soldanii Hantken, Mitth. Jahrg. ung. geol. Anstalt., 1875, p. 80, pl. 9, figs. 7*a–c*.—H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 706, pl. 107, figs. 6, 7.—H. B. Brady, Parker, and Jones, Trans. Zool. Soc., vol. 12, 1888, p. 229.—Terrigi, Mem. Com. Geol. Italia, vol. 4, 1891, p. 109, pl. 4, fig. 15.—Egger, Abhandl. kön. bay. Akad. Wiss. München, Cl.II, vol. 18, 1893, p. 420, pl. 19, figs. 16–18, 51.—Woodward, The Observer, vol. 4, 1893, p. 178.—Silvestri, Mem. Accad. Pont. Nuovi Lincei, vol. 9, 1893, p. 215.—Chapman, Proc. Zool. Soc. London,

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[21] British Antarctic Exped., Zoology, vol. 6, 1922, p. 219.

1895, p. 43.—Silvestri, Atti Accad. Sci. Acireale, vol. 7, 1896, p. 90.—Flint, Ann. Rep't. U. S. Nat. Mus., 1897 (1899), p. 332, pl. 75, fig. 4.—Silvestri, Mem. Pont. Accad. Nuovi Lincei, vol. 6, 1899, p. 328, pl. 6, fig. 14.—Kiaer, Rep't. Norwegian Fish. and Mar. Invest., vol. 1, No. 7, 1900, p. 47.—Fornasini, Mem. Accad. Sci. Istit. Bologna, ser. 5, vol. 10, 1902, p. 60, text fig. 59.—Millett, Journ. Roy. Micr. Soc., 1904, p. 503.—Chapman, Trans. New Zealand Instit., vol. 38, 1905 (1906), p. 106; Journ. Quekett Micr. Club, ser. 2, vol. 10, 1907, p. 140.—Bagg, Proc. U. S. Nat. Mus., vol. 34, 1908, p. 163.—Chapman, Subantarctic Islands of New Zealand, 1909, p. 362; Journ. Linn. Soc. Zool., vol. 30, 1910, p. 423; Zool. Res. *Endeavour*, pt. 3, 1912, p. 311.—Pearcey, Trans. Roy. Soc., Edinburgh, vol. 49, 1914, p. 1,030.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 5, 1915, p. 71, pl. 29, fig. 1; pl. 31, fig. 4.—Heron-Allen and Earland, Trans. Zool. Soc. London, vol. 20, 1915, p. 719.—Chapman, Biol. Res. *Endeavour*, vol. 3, pt. 1, 1915, p. 33.—Cushman, Proc. U. S. Nat. Mus., vol. 56, 1919, p. 631; Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 349, pl. 71, figs. 2 *a–c*.—Heron-Allen and Earland, British Antarctic Exped., Zoology, vol. 6, 1922, p. 219.—Yabe and Hanzawa, Jap. Journ. Geol. Pal., vol. 4, 1925 (1926), p. 52.—R. E. and K. C. Stewart, Journ. Pal., vol. 4, 1930, pl. 8, figs. 9 *a–c*; pl. 9, figs. 1 *a–c*.

Test plano-convex, dorsal side flat or even slightly depressed, the outer portion toward the periphery often channelled, ventral side very convex, umbilicus deeply excavated, periphery rounded; chambers fairly distinct, but often somewhat hidden on the dorsal side by the calcareous thickening, width of the whorl variable; sutures fairly distinct, those of the dorsal side in the early stages nearly radial becoming more oblique in the adult, usually slightly oblique, those of the ventral side radial, very little if at all depressed; wall thick, smooth and often polished, about the umbilicus sometimes granular; aperture, an elongate slit at the ventral border of the chamber usually about halfway between the umbilicus and periphery, sometimes with a slightly thickened border.

Diameter up to about 2 mm.

This is a very common species in the *Albatross* dredgings from the Western Atlantic. It has a heavy, thickened test and is very white and often highly polished. The early stages are often quite single with a smooth test, rounded periphery and no channelling of the dorsal surface (pl. 8, fig. 3). In the adult there is often considerable variation in the same sample. The last whorl of chambers may be narrow (pl. 8, fig. 6) or somewhat flattened and wider. The whorl itself may come above the previous ones or may come well below (pl. 8, fig. 6). The early stages have been referred to d'Orbigny's *G. laevigata* by some authors.

The fossil records have for the most part not been included in the above references as many of them evidently do not belong to this species.

Gyroidina soldanii—Material examined

Cat. No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
			Albatross	° ′ ″ ° ′ ″				
21220	U.S.N.M.	1	D2035	39 26 16 N.; 70 02 37 W	1,362	------	glob. oz	Rare.
3139	U.S.N.M.	1	D2037	38 53 00 N.; 69 23 36 W	1,731	38	glob. oz	Do.
21221	U.S.N.M.	1	D2038	38 30 30 N.; 69 08 25 W	2,033	------	glob. oz	Do.
21222	U.S.N.M.	7	D2039	38 19 26 N.; 68 20 20 W	2,369	------	glob. oz	Common.
21223	U.S.N.M.	2	D2041	39 22 50 N.; 68 25 00 W	1,608	38	glob. oz	Do.
21224	U.S.N.M.	9						
21225	U.S.N.M.	1	D2042	39 33 00 N.; 68 26 45 W	1,555	38.5	glob. oz	Rare.
21226	U.S.N.M.	1						
21227	U.S.N.M.	2	D2097	37 56 20 N.; 70 57 30 W	1,917	------	glob. oz	Do.
21228	U.S.N.M.	1						
21229	U.S.N.M.	4	D2105	37 50 00 N.; 73 03 50 W	1,395	41	glob. oz	Few.
21230	U.S.N.M.	9	D2116	35 45 23 N.; 74 31 25 W	888	39	bu. m., fne. s	Common.
21231	U.S.N.M.	3	D2138	17 44 05 N.; 75 39 00 W	23	------	co., brk. sh	Rare.
21232	U.S.N.M.	2	D2226	37 00 00 N.; 71 54 00 W	2,045	36.8	glob. oz	Do.
21233	U.S.N.M.	3	D2352	22 35 00 N.; 84 23 00 W	463	45	wh. co	Do.
21234	U.S.N.M.	1	D2355	20 56 48 N.; 86 27 00 W	399	------	yl. oz	Do.
21235	U.S.N.M.	1	D2394	28 38 30 N.; 87 02 00 W	420	41.8	gn. m	Do.
21236	U.S.N.M.	1	D2400	28 41 00 N.; 86 07 00 W	169	------	gy. m	Do.
21237	U.S.N.M.	1	D2550	39 44 30 N.; 70 30 45 W	1,081	38.5	gn. m	Do.
21238	U.S.N.M.	8	D2562	39 15 30 N.; 71 25 00 W	1,434	37.3	gy. oz	Common.
21239	U.S.N.M.	1	D2564	39 22 00 N.; 71 23 30 W	1,390	37.3	gy. oz	Rare.
21240	U.S.N.M.	3	D2585	39 08 30 N.; 72 17 00 W	542	39	dk. gy. m	Do.
21241	U.S.N.M.	3	D2682	39 38 00 N.; 70 22 00 W	990	------	gn. m	Do.
21242	U.S.N.M.	4	D2714	38 22 00 N.; 70 17 30 W	1,825	------	br. oz	Few.

GYROIDINA SOLDANII d'Orbigny, var. NITIDULA (Schwager)

Plate 8, figures 9 *a–c*

Rotalia nitidula Schwager, *Novara*-Exped., Geol. Theil, vol. 2, 1866, p. 263, pl. 7, fig. 110.

Variety differing from the typical in the very narrow last-formed whorl with the sutures very strongly oblique.

It may be useful to distinguish this variety which occurs especially in the Pliocene of the Pacific, Kar Nicobar, New Guinea, etc., as well as in the present oceans. It is rare in the Atlantic. A specimen which may be referred to this variety is shown on Plate 8, figure 9. It is close to the form which Brady refers to "*Rotalia broeckhiana* Karrer," but the spire in our form is low. All are probably the same.

Gyroidina soldanii, var. *nitidula—Material examined*

Catalogue No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
			Albatross	° ′ ″ ° ′ ″				
21243	U.S.N.M.	2	D2106	37 41 20 N.; 73 03 20 W	1,497	42.5	glob. oz	Rare.
21244	U.S.N.M.	3	D2144	9 49 00 N.; 79 31 30W	896	------	gn. m	Do.
21245	U.S.N.M.	3	D2192	39 46 30 N.; 70 14 45W	1,060	38.6	gy. oz	Do.
21246	U.S.N.M.	3	D2208	39 33 00 N.; 71 16 15W	1,178	38.4	gn. m	Do.
			Flying Fox					
12926	J.A.C.	1	----------	West of Ireland	1,000	------	-------------	Do.

GYROIDINA SOLDANII d'Orbigny, var. ALTIFORMIS R. E. and K. C. Stewart

Plate 8, figures 10 *a–c;* plate 9, figures 1 *a–c*

Gyroidina soldanii d'Orbigny, var. *altiformis* R. E. and K. C. Stewart, Journ. Pal., vol. 4, 1930, p. 67, pl. 9, figs. 2 *a–c*.

Variety differing from the typical in the deep form of the test and the chambers of the last-formed whorl which have the faces flattened obliquely and tilted giving a peculiar overlapping appearance to chambers, the dorsal sutures are also somewhat raised.

This variety has been recently described from the Pliocene of California, and appears to be living in restricted areas in the Western Atlantic. Plate 8, figure 10 shows a fairly young specimen, and Plate 9, figure 1 an adult.

Gyroidina soldanii, var. *altiformis—Material examined*

Cat. No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
			Albatross	° ′ ″ ° ′ ″				
21247	U.S.N.M.	10+	D2552	39 47 07 N.; 70 35 00 W	721	39.6	gy. oz	Abundant.
21248	U.S.N.M.	1						
21249	U.S.N.M.	1		Off Fowey, Fla	100			Rare.

Genus ROTALIATINA Cushman, 1925

Rotaliatina Cushman, Contr. Cushman Lab. Foram. Res., vol. 1, 1925, p. 4; Special Publ. No. 1, Cushman Lab. Foram. Res., 1928, p. 272.
Rotalina (part) of Authors (not d'Orbigny).

Genoholotype.—Rotaliatina mexicana Cushman.

Test free, trochoid, close coiled, composed of about three volutions, the last one composed of numerous chambers, all visible from the dorsal side, only those of the last-formed coil from the ventral side, ventrally umbilicate; wall calcareous, finely perforate; aperture, an arched slit between the base of the apertural face and the previous coil.

Eocene.

Subfamily 4. ROTALIINAE

Test trochoid, umbilical region typically closed, sometimes with a definite conical plug of clear shell material; wall of the test often double and a tubular canal system developed; aperture ventral, along the margin of the chamber between the periphery and the umbilical area.

Genus EPONIDES Montfort, 1808

Eponides Montfort, Conch. Syst., vol. 1, 1808, p. 127.—Cushman, Special Publ. No. 1, Cushman Lab. Foram. Res., 1928, p. 272.
Nautilus (part) of Authors.
Rotalia (part) of Authors.
Rotalina (part) of Authors.
Pulvinulina Parker and Jones, in Carpenter, Parker, and Jones, Introd. Foram., 1862, p. 201 (genotype, by designation, *Nautilus repandus* Fichtel and Moll).
Placentula (part) Berthelin (not Lamarck).
Cyclospira Eimer and Fickert, Zeitschr. Wiss. Zool., vol. 65, 1899, p. 702 (genoholotype, *Rotalina schreibersii* d'Orbigny).

Genoholotype.—Nautilus repandus Fichtel and Moll.

Test trochoid, usually biconvex, umbilical area closed but not typically with a plug; wall calcareous, perforate; aperture, a low opening between the periphery and umbilical area, usually well away from the peripheral margin.

The species of this genus are so numerous that they are here taken up alphabetically for ease in reference. As a rule the umbilical area is filled, but not showing a definite plug as in *Rotalia*. The aperture is usually fairly small and well defined midway between the umbilicus and periphery on the ventral side.

EPONIDES ANTILLARUM (d'Orbigny)

Plate 9, figures 2 *a–c*

Rosalina antillarum d'Orbigny, in De la Sagra, Hist. Fis. Pol. Nat. Cuba, 1839, "Foraminifères," p. 75, pl. 5, figs. 4–6.
Truncatulina antillarum Fornasini, Mem. Accad. Sci. Istit. Bologna, ser. 5, vol. 10, 1902, p. 63.—Cushman, Proc. U. S. Nat. Mus., vol. 59, 1921, p. 57, pl. 13, figs. 6–8; Publ. 311, Carnegie Instit. Washington, 1922, p. 48.
Pulvinulina incerata Cushman, Publ. 311, Carnegie Instit. Washington, 1922, p. 51, pl. 9, figs. 1–3; Publ. 344, 1926, p. 79.

Test unequally biconvex, dorsal side somewhat more convex than the ventral, periphery subacute; chambers numerous, 7 or 8 in the last-formed coil; sutures oblique, rather indistinct and very slightly if at all depressed on the dorsal side, nearly radiate and somewhat depressed on the ventral side; wall fairly thick, finely punctate, otherwise smooth, ventrally somewhat umbilicate, the apertural face of the last-formed chamber obliquely angled; aperture elongate, at the base of the last-formed chamber; color white.

Diameter up to 1 mm.

The young stage or perhaps the megalospheric form described and figured by d'Orbigny becomes in the large microspheric form a test with thick walls, more numerous chambers and a tendency for the ends of the limbate sutures around the umbilical region to develop a ring of beads, never more than one at the end of each suture, but often growing to considerable size. This species seems to be a characteristic one of the Florida region both at stations fairly close to shore but at some depths and also in some of the *Albatross* dredgings in the general region. Most of the Tortugas bottom samples were not deep enough to contain this species in any abundance.

It resembles the form usually recorded as "*Pulvinulina schreibersii*",[22] but the Florida form is usually not nearly as high as that from the Pacific. It also resembles *Eponides berthelotiana* (d'Orbigny).

Eponides antillarum—*Material examined*

Catalogue No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
			Albatross	° ′ ″ ° ′ ″				
21528	U.S.N.M.	1	D2311	32 55 00 N.; 77 54 00 W	79	59.1	crs. s., bk.sp.	Rare.
21529	U.S.N.M.	3	D2312	32 54 00 N.; 77 53 30 W	88	57.8	crs. s., bk.sp.	Do.
21530	U.S.N.M.	1	D2313	32 53 00 N.; 77 53 00 W	99	57.2	crs. s., bk.sp.	Do.
21531	U.S.N.M.	3	D2314	32 43 00 N.; 77 51 00 W	159	47.4	crs. s., bk.sp.	Do.
21532	U.S.N.M.	1	D2318	24 25 45 N.; 81 46 00 W	45	75	co.	Do.
21533	U.S.N.M.	7	D2399	28 44 00 N.; 86 18 00 W	196	51.6	gy. m.	Common.
21534	U.S.N.M.	8	D2542	40 00 15 N.; 70 42 20 W	129	47.2	s., brk. sh.	Do.
21535	U.S.N.M.	10+	D2544	40 01 45 N.; 70 24 00 W	131	47.7	gn. s., bk.sp.	Abundant
21536	U.S.N.M.	1						
21537	U.S.N.M.	1	D2562	39 15 30 N.; 71 25 00 W	1434	37.3	gy. oz.	Rare.
21538	U.S.N.M.	1	D2641	25 11 30 N.; 80 10 00 W	60	69.2	co. s.	Do.
12936	J.A.C.	2		Off Government Cut, Miami, Fla.	30			Do.
21539	U.S.N.M.	3						
21540	U.S.N.M.	2		Off Turtle Harbor, Fla.	20			Do.
12937	J.A.C.	2		Off Long Reef, Fla.	40			Do.
12938	J.A.C.	1		Off Sand Key, Fla.	72			Do.
12939	J.A.C.	1		Off Key West, Fla.	78			Do.
21541	U.S.N.M.	3		Off Ragged Key, Fla.	70			Do.
12940	J.A.C.	1		do.	85			Do.
12941	J.A.C.	1		do.	71			Do.
21542	U.S.N.M.	6		do.	80			Few.
21543	U.S.N.M.	4		Off Ajax Reef, Fla.	40			Do.
21544	U.S.N.M.	1		Off Sambo Key, Fla.	58			Rare.
21545	U.S.N.M.	3		Off Fowey, Fla.	22			Do.
12942	J.A.C.	2		do.	23			Do.
21546	U.S.N.M.	2		do.	28			Do.
12943	J.A.C.	5		do.	42			Few.
21547	U.S.N.M.	7		do.	45			Common.
21548	U.S.N.M.	2		do.	45			Do.
12944	J.A.C.	6		do.	52			Few.
12945	J.A.C.	1		do.	60			Rare.
21549	U.S.N.M.	2		do.	70			Do.
21550	U.S.N.M.	2		do.	78			Do.
21551	U.S.N.M.	2		do.	120			Do.
3037	J.A.C.	2	23	Dry Tortugas, Fla.	10.5		m. s.	Do.
3039	J.A.C.	3	42	do.	18		s.	Few.
3038	J.A.C.	6						
2853	J.A.C.	1		Montego Bay, Jamaica.	10			Rare.
3040	J.A.C.	2	5	San Juan Harbor, P. R.	3			Do.
12946	J.A.C.	1	2	Casco Bay, Me.				Do.

EPONIDES CONCENTRICA (Parker and Jones)

Plate 9, figures 4, 5

Pulvinulina concentrica Parker and Jones, Ms., in H. B. Brady, Trans. Linn. Soc. Zool., vol. 24, 1864, p. 470, pl. 48, fig. 14.—Parker and Jones, Philos. Trans., vol. 155, 1865, p. 393.—H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 686, pl. 105, figs. 1*a–c*.—Uhlig, Jahrb. k. k. geol. Reichs., vol. 36, 1886, p. 190, pl. 3, figs. 3, 4.—Egger, Abhandl. kön. bay. Akad. Wiss. München, Cl. II, vol. 18, 1893, p. 415, pl. 17, figs. 38–40.—Goës (in part), Kongl. Svensk. Vet. Akad. Handl., vol. 25, No. 9, 1894, p. 97, pl. 16, fig. 802 (not 803).—Grzybowski, Rozprawy Wydz. Mat.-Przyr. Akad. Umiej.-Krakowie, vol. 29, 1894, p. 202, pl. 4, fig. 9.—Kiaer, Rep't. Norwegian Fish. Mar. Invest., vol. 1, No. 7, 1900, p. 47.—Chapman, Journ. Linn. Soc. Zool., vol. 28, 1902, p. 407 (list).—Millett, Journ. Roy. Micr. Soc., 1904, p. 497.—Earland, Journ. Quekett Micr. Club, ser. 2, vol. 9, 1905, p. 226.—Sidebottom, Mem. Proc. Manchester Lit. Philos. Soc., vol. 53, No. 21, 1909, p. 7, pl. 3, fig. 5.—Chapman, Subantarctic Islands of New Zealand, 1909, p. 360.—Sidebottom, Mem. Proc. Manchester Lit. Philos. Soc., vol. 54, No. 16, 1910, p. 28.—Heron-Allen and Earland, Proc. Roy. Irish Acad., vol. 31, pt. 64, 1913, p. 135.—Chapman, Biol. Res. *Endeavour*, vol. 3, pt. 1, 1915, p. 32.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 5, 1915, p. 51, pl. 28, fig. 4.—Heron-Allen and Earland, Trans. Zool. Soc. London, vol. 20, 1915, p. 714; Journ. Roy. Micr. Soc., 1916, p. 51.—Cushman, Proc. U. S. Nat. Mus., vol. 56, 1919, p. 629; Bull. 100, vol. 4, 1921, p. 327, pl. 68, figs. 4*a–c*.—Heron-Allen and Earland, Bull. Soc. Sci. Hist. Nat. Corse, 1922, p. 138; British Antarctic Exped., Zoology, vol. 6, 1922, p. 214; Journ. Linn. Soc. Zool., vol. 35, 1924, p. 636; Journ. Roy. Micr. Soc., 1930, p. 189.

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[22] *Challenger*, pl. 115, figs. 1*a–c*.

Discorbina vestita Seguenza, Mem. Accad. dei Lincei, ser. 3, vol. 6, 1880, p. 148, pl. 13, fig. 39.

Test biconvex, periphery rounded, ventral side somewhat concave; chambers very distinct, five to seven in the last-formed whorl, border with a thickened edge joining with the limbate thickened sutures leaving a central area on each chamber face thin and translucent; wall finely perforate in the thin portion; aperture below the chamber margin on the ventral side.

Diameter up to 2 mm.

This is a very distinctive and widely distributed species. It does not seem to be at all common in the Western Atlantic either in the West Indian region or northward.

The thickening of the wall is very variable in relative amount, some of the largest specimens being almost completely covered with this secondary material.

There are numerous fossil records but I have not attempted to give the references here.

Eponides concentrica—Material examined

Catalogue No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
12947	J.A.C.	1		Off Sambo Key, Fla	50			Rare.
12948	J.A.C.	1		Off Long Key, Fla	40			Do.
21552 21553	U.S.N.M. U.S.N.M.	1		Off Fowey, Fla	45			Do.

EPONIDES EXIGUA (H. B. Brady)

Plate 10, figures 1, 2

Pulvinulina exigua H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 696, pl. 103, figs. 13, 14.—Chapman, Proc. Zool. Soc. London, 1895, p. 43.—Goës, Bull. Mus. Comp. Zoöl., vol. 29, 1896, p. 75.—Chapman, Journ. Linn. Soc. Zool., vol. 28, 1902, p. 407 (list); Subantarctic Islands of New Zealand, 1909, p. 361; Journ. Linn. Soc. Zool., vol. 30, 1910, p. 422.—Sidebottom, Mem. Proc. Manchester Lit. Philos. Soc., vol. 54, No. 16, 1910, p. 28.—Chapman, Zool. Res. *Endeavour*, pt. 3, 1912, p. 311.—Pearcey, Trans. Roy. Soc. Edinburgh, vol. 49, 1914, p. 1029.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 5, 1915, p. 60, pl. 23, fig. 5.—Chapman, Biol. Res. *Endeavour*, vol. 3, pt. 1, 1915, p. 32.—Sidebottom, Journ. Roy. Micr. Soc., 1918, p. 260.—Heron-Allen and Earland, British Antarctic Exped., Zoology, vol. 6, 1922, p. 217.

Test small, almost equally biconvex, peripheral margin bluntly rounded, often lobulated; chambers few, five or six in the last-formed whorl, periphery of each marked by clear material; sutures distinct, on the dorsal side somewhat oblique, ventrally nearly radial and more distinctly depressed; wall smooth; aperture at the margin of the last-formed chamber, on the ventral side midway between the periphery and the umbilicus.

Diameter, 0.30 to 0.50 mm.

This is a very distinctive little species, very widely distributed in fairly deep water. The only specimens I have had from the Atlantic are from *Albatross* Stations, and they are rare. Brady in the *Challenger* Report records the species from twelve stations in the North Atlantic from 64 to 2,740 fathoms, and at four in the South Atlantic, 1,025 to 2,470 fathoms.

Eponides exigua—Material examined

Catalogue No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
			Albatross	° ′ ″ ° ′ ″				
21554	U.S.N.M.	1	D2352	22 35 00 N.; 84 23 00 W.	463	45	wh. co.	Rare.
21555	U.S.N.M.	1	D2629	23 48 40 N.; 75 10 40 W.	1,169	38.4	co. s.	Do.

EPONIDES FRIGIDA (Cushman)

Pulvinulina karsteni H. B. Brady (not Reuss), Trans. Linn. Soc. London, vol. 24, 1864, p. 470, pl. 48, fig. 15; Ann. Mag. Nat. Hist., ser. 5, vol. 1, 1878, p. 436, pl. 21, fig. 11 *a–c*.

Pulvinulina repanda (Fichtel and Moll), var. *karsteni* Parker and Jones, Philos. Trans., vol. 155, 1865, p. 396, pl. 14, figs. 14, 15, 17.

Pulvinulina frigida Cushman, Contrib. Canadian Biol., 1921 (1922), p. 12.

Test small, biconvex, rotaliform, composed of about two and one-half coils; chambers distinct, usually six in the last-formed coil; sutures distinct but not depressed on the dorsal side, on the ventral side slightly depressed and filled with an amorphous material radiating out from the umbilical region; wall clear and translucent on the dorsal side, usually showing all the chambers back to the proloculum distinctly, on the ventral side less clear.

Diameter up to 0.4 mm.

This Arctic, or at least cold-water species, was obtained at stations 2, 3, and 5, Hudson Bay. It is not the same as *P. karsteni* Reuss, as a reference to the original figures will show, especially the ventral side. The figures given by Parker and Jones of Arctic specimens are very excellent for this species as it occurs in Hudson Bay. There is little or no trace of any carina on the ventral side except that the material filling the sutural depressions sometimes becomes confluent along the periphery. This species was referred by Brady to *P. karsteni* in 1864, and he has been followed since. Brady's notes in 1864 are interesting in this connection.

"Three or four small starved specimens of this species have been pointed out amongst my mountings by Mr. Parker. * * * As I have never met with mature specimens, I can only refer to Professor Reuss's memoir on the Chalk of Mecklenburg,[23] and in this instance I have preferred copying his figures of the shell to drawing direct from immature specimens."

The following quotation is from Parker and Jones in 1865:

"This is a neat, many-chambered, moderately conical variety of *P. repanda,* with some degree of limbation bordering the chambers, especially beneath, where a wheel-like system of exogenous shell matter characterizes the shell."

They also note the differences between the Arctic and North Atlantic specimens referred to this species and also that Reuss's figure is not exactly like either.

P. frigida is evidently an Arctic species of definite distribution and definitely characterized.

There are numerous references for this species in the North Atlantic. It is not the same as Reuss's species from the Cretaceous. The filling of the ventral sutures is a characteristic feature.

Eponides frigida—Material examined

Catalogue No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
12949	J. A. C.	3	------	Off Gaspé	------	------	------	Rare.
3056	J. A. C.	1	------	Gaspé Bay	30–40	------	------	Do.
12950	J. A. C.	5	------	Coast of Iceland	------	------	------	Few.
12951	J. A. C.	1						
3031	J. A. C.	2	------	Richmond Gulf, Hudson Bay	15–20	------	s., st	Rare.
3034	J. A. C.	1	------	S. of Black Whale Harbor, Hudson Bay.	10	------	s., g., m	Do.
3032	J. A. C.	1						
3033	J. A. C.	1	------	S. side of Gray Goose Id., Hudson Bay.	10	------	s., m	Do.

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[23] Zeitschr. Deutsch. Geol. Gesellsch., vol. 7, 1855, p. 273, pl. 9, fig. 6.

EPONIDES FRIGIDA (Cushman), var. CALIDA Cushman and Cole

Plate 10, figures 3, 4

Eponides frigida (Cushman), var. *calida* Cushman and Cole, Contr. Cushman Lab. Foram. Res., vol. 6, 1930, p. 98, pl. 13, figs. 13.

Variety differing from the typical in the fewer chambers, smaller size, more compact test, and broadly rounded periphery.

In Buzzards Bay this variety is a very common form occurring in several dredge hauls in shallow water. It seems to be very different from the larger form in more northern, colder waters.

Eponides frigida, var. *calida—Material examined*

Catalogue No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
12952	J. A. C.	1	------	Buzzards Bay, Mass	------	------	------	Abundant.
12953	J. A. C.	10+	------	do	------	------	------	Do.
12954	J. A. C.	10	------	do	------	------	------	Do.
12955	J. A. C.	2	------	do	------	------	------	Do.
12956	J. A. C.	5	------	do	------	------	------	Do.
12957	J. A. C.	1	------	Eastport, Me	------	------	------	Rare.

EPONIDES (?) LATERALIS (Terquem)

Plate 10, figures 5 *a–c*

Rosalina lateralis Terquem, Mém. Soc. Géol. France, sér. 3, vol. 1, Mém. 3, 1878, p. 25, pl. 2, figs. 11 *a–c*.

Pulvinulina lateralis H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 689, pl. 106, figs. 2, 3; Quart. Journ. Geol. Soc., vol. 44, 1888, p. 9.—Egger, Abhandl. kön. bay. Akad. Wiss. München, Cl. II, vol. 18, 1893, p. 413, pl. 18, figs. 48-50 (?).—Chapman, Journ. Linn. Soc. Zool., vol. 28, 1902, p. 407.—Millett, Journ. Roy. Micr. Soc., 1904, p. 497.—Cushman, Proc. Boston Soc. Nat. Hist., vol. 34, 1908, p. 30, pl. 5, figs. 11, 12.—Sidebottom, Mem. Proc. Manchester Lit. Philos. Soc., vol. 53, No. 21, 1909, p. 5, pl. 2, fig. 6; pl. 3, figs. 1, 2; vol. 54, No. 16, 1910, p. 27.—Heron-Allen and Earland, Journ. Roy. Micr. Soc., 1911, p. 339; Trans. Zool. Soc. London, vol. 20, 1915, p. 714, pl. 53, figs. 6-11.—Martinotti, Atti Soc. Ital. Sci. Nat., vol. 59, 1920, p. 333.—Cushman, Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 336, pl. 69, figs. 2 *a-c*.—Heron-Allen and Earland, Journ. Linn. Soc. Zool., vol. 35, 1924, p. 636; Journ. Roy. Micr. Soc., 1924, p. 179.—Hanzawa, Jap. Journ. Geol. Pal., vol. 4, 1925 (1926), p. 44 (table).

The generic position of this species is somewhat in doubt. It has some of the characters of *Cancris* in some specimens which have a thin plate over the ventral side of the last chamber, and the dorsal side of many specimens resembles *Cancris*. It is however subject to much change in the last few chambers in adults probably due to attachment. The peculiar coarsely perforated last chamber is distinctive.

The species is most common in tropical and subtropical waters, but is very abundant off the southern coast of New England where the influence of the Gulf Stream is marked.

The relationship of this species to *Eponides repanda* should be noted here. Some of the younger specimens show this resemblance strongly, and it may finally be decided that the form figured here is only a variety of *E. repanda.* Its relation to the following species is also to be determined.

Eponides lateralis—Material examined

Catalogue No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
21682	U.S.N.M.	1	*Albatross* D2386	29° 15′ 00″ N.; 88° 06′ 00″ W.	60	61.8	bu. m.	Rare.
12958	J. A. C.	9		Newport Beach, Newport, R. I.				Abundant.
12959	J. A. C.	10+		do				Do.
12960	J. A. C.	10+		do				Do.
12961	J. A. C.	2		do				Do.

EPONIDES PUNCTULATA (d'Orbigny)

Plate 10, figures 6 *a-c*

Rotalia punctulata D'ORBIGNY, Ann. Sci. Nat., vol. 7, 1826, p. 273, No. 25; Modèles No. 12.

Pulvinulina punctulata PARKER, JONES, and H. B. BRADY, Ann. Mag. Nat. Hist., ser. 3, vol. 16, 1865, p. 20, pl. 3, fig. 82.—H. B. BRADY, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 685, pl. 104, figs. 17*a-c*.—WOODWARD, The Observer, vol. 4, 1893, p. 177.—GOËS, Kongl. Svensk. Vet. Akad. Handl., vol. 25, No. 9, 1894, p. 96, pl. 16, figs. 797-800.—CHAPMAN, Proc. Zool. Soc. London, 1895, p. 43.—JONES, Foram. Crag, pt. 4, 1897, p. 319, pl. 2, figs. 22-24.—FLINT, Ann. Rep't. U. S. Nat. Mus., 1897 (1899), p. 328, pl. 73, fig. 1.—KIAER, Rep't Norwegian Fish. Mar. Invest., vol. 1, No. 7, 1900, p. 46.—CHAPMAN, Journ. Quekett Micr. Club, ser. 2, vol. 10, 1907, p. 139.—BAGG, Proc. U. S. Nat. Mus., vol. 34, 1908, p. 163.—HERON-ALLEN and EARLAND, Journ. Roy. Micr. Soc., 1909, p. 683; 1910, p. 426.—CHAPMAN, Proc. Roy. Soc. Victoria, vol. 22, 1910, p. 287.—HERON-ALLEN and EARLAND, Proc. Roy. Irish Acad., vol. 31, pt. 64, 1913, p. 134, pl. 4, figs. 20, 21.—CUSHMAN, Bull. 71, U. S. Nat. Mus., pt. 5, 1915, p. 52, pl. 24, figs. 1 *a–c*.—HERON-ALLEN and EARLAND, Trans. Linn. Soc. London, ser. 2, vol. 11, 1916, p. 275; Journ. Roy. Micr. Soc., 1916, p. 51.—MARTINOTTI, Atti Soc. Ital. Sci. Nat., vol. 59, 1920, p. 333.—CUSHMAN Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 328, pl. 68, figs. 1 *a–c*.—HERON-ALLEN and EARLAND, British Antarctic Exped., Zoology, vol. 6, 1922, p. 214.—HOFKER, Flora en Fauna der Zuiderzee, Protozoa, 1922, p. 149, fig. 45 (in text).—HERON-ALLEN and EARLAND, Journ. Roy. Micr. Soc., 1924, p. 179; 1930, p. 189.

Pulvinulina repanda, var. *punctulata* PARKER and JONES, Philos. Trans., vol. 155, 1865, p. 394, pl. 14, figs. 12, 13.

Test generally plano-convex, dorsal side in a low spire with convex sides, ventral side somewhat umbilicate, periphery rounded; chambers distinct, slightly inflated, very gradually enlarging in size as added; sutures distinct, very slightly depressed on the dorsal side, deeply so on the ventral side, obliquely curved on both sides; wall smooth, thick, very finely perforate, sometimes with a few large pores; aperture, a narrow slit along the ventral side of the chamber. Diameter up to 3 mm.

This is a fine large species apparently most typically developed in the North Atlantic and Mediterranean. I have found it to be very rare in the *Albatross* dredgings occurring at but two stations, D2415 and D2416, off the southeastern coast of the United States.

Eponides punctulata—Material examined

Catalogue No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
21683	U.S.N.M.	1	*Albatross* D2416	31° 26′ 00″ N.; 79° 07′ 00″ W.	276	53.8	co.,brk.sh.	Rare.

EPONIDES PYGMAEA (Hantken) (?)

Under this name, Brady figures a very small species from deep water dredgings of the *Challenger* expedition. It is rather obvious that they do not represent Hantken's species when a study is made of topotype material from the *Clavulina*-Szaboi beds of Hungary and a comparison made with Hantken's figures. I have no material that will fit this species from the *Albatross* collections. The published records referred to this species represent several distinct things.

EPONIDES REPANDA (Fichtel and Moll)

Plate 10, figures 7 *a–c*

Nautilus repandus Fichtel and Moll, Test. Micr., 1798, p. 35, pl. 3, figs. *a–d*.

Eponides repandus Montfort, Conch. Syst., vol. 1, 1808, p. 127, 32ᵉ genre.—Cushman, Contr. Cushman Lab. Foram. Res., vol. 3, 1927, pl. 16, fig. 9; Special Publ. No. 1, Cushman Lab. Foram. Res., 1928, pl. 40, fig. 1; pl. 41, fig. 9.—Cushman and Kellett, Proc. U. S. Nat. Mus., vol. 75, art. 25, 1929, p. 11, pl. 4, figs. 7 *a–c*.

Pulvinulina repanda Carpenter, Introd. Foram., 1862, p. 210.—H. B. Brady, Trans. Linn. Soc. Zool., vol. 24, 1864, p. 474.—Terrigi, Atti Accad. Pont. Nuovi Lincei, vol. 33, 1880, p. 206, pl. 3, fig. 61; vol. 35, 1883, p. 198, pl. 3, fig. 42.—H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 684, pl. 104, figs. 18 *a–c*.—Sherborn and Chapman, Journ. Roy. Micr. Soc., 1886, p. 757, pl. 16, figs. 18 *a–c* (?).—Howchin, Trans. Proc. Roy. Soc. So. Australia, vol. 12, 1889, p. 14.—Egger, Abhandl. kön. bay. Akad. Wiss. München, Cl. II, vol. 18, 1893, p. 405, pl. 18, figs. 34–36.—Woodward, The Observer, vol. 4, 1893, p. 178.—

Goës, Kongl. Svensk. Vet. Akad. Handl., vol. 25, No. 9, 1894, p. 95, pl. 16, fig. 801.—Amicis, Nat. Sicil., Ann. 14, 1895, p. 119.—Silvestri, Atti Accad. Sci. Acireale, vol. 7, 1895–96 (1896), p. 53.—Goës, Bull. Mus. Comp. Zoöl., vol. 29, 1896, p. 75.—Jones, Foram. Crag, pt. 4, 1897, p. 317, pl. 2, figs. 25–27.—Flint, Ann. Rep't. U. S. Nat. Mus., 1897 (1899), p. 328, pl. 72, fig. 8.—Wright, Irish Nat., vol. 9, 1900, p. 55.—Chapman, Journ. Linn. Soc. Zool., vol. 28, 1902, pp. 196, 209, 407.—Millett, Journ. Roy. Micr. Soc., 1904, p. 496.—Chapman, Journ. Quekett Micr. Club, ser. 2, vol. 10, 1907, p. 138.—Millett, Rec. Foram. Galway, 1908, p. 6.—Bagg, Proc. U. S. Nat. Mus., vol. 34, 1908, p. 163.—Chapman, Subantarctic Islands of New Zealand, 1909, p. 360.—Sidebottom, Mem. Proc. Manchester Lit. Philos. Soc., vol. 53, No. 21, 1909, p. 5.—Chapman, Journ. Linn. Soc. Zool., vol. 30, 1910, p. 422.—Schubert, Abhandl. k. k. Reichs., vol. 20, pt. 4, 1911, p. 110.—Heron-Allen and Earland, Journ. Roy. Micr. Soc., 1911, p. 340.—Bagg, Bull. 513, U. S. Geol. Survey, 1912, p. 87, pl. 24, figs. 5–8.—Heron-Allen and Earland, Proc. Roy. Irish Acad., vol. 31, pt. 64, 1913, p. 134.—Pearcey, Trans. Roy. Soc. Edinburgh, vol. 49, 1914, p. 1041.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 5, 1915, p. 50, pl. 24, fig. 3.—Heron-Allen and Earland, Trans. Zool. Soc. London, vol. 20, 1915, p. 713.—Chapman, Biol. Res. *Endeavour*, vol. 3, 1915, p. 32.—Heron-Allen and Earland, Trans. Linn. Soc. London, ser. 2, vol. 11, 1916, p. 275; Journ. Roy. Micr. Soc., 1916, p. 51.—Cushman, Bull. 676, U. S. Geol. Survey, 1918, p. 66.—Martinotti, Atti Soc. Ital. Sci. Nat., vol. 59, 1920, p. 333.—Cushman, Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 326.—Heron-Allen and Earland, Bull. Soc. Sci. Hist. Nat. Corse, 1922, p. 138; British Antarctic Exped., Zoology, vol. 6, 1922, p. 213.—Cushman, Publ. 311, Carnegie Instit. Washington, 1922, p. 51, pl. 8, figs. 10–12.—Hofker, Flora en Fauna der Zuiderzee, Protozoa, 1922, p. 148, fig. 44 (in text).—Cushman, Publ. 342, Carnegie Instit. Washington, 1924, p. 42, pl. 13, figs. 9, 10.—Heron-Allen and Earland, Journ. Linn. Soc. Zool., vol. 35, 1924, p. 636; Journ. Roy. Micr. Soc., 1924, p. 178.—Cushman, Contr. Cushman Lab. Foram. Res., vol. 1, pt. 2, 1925, p. 43.—Hanzawa, Jap. Journ. Geol. Pal., vol. 4,, 1925 (1926), p. 44.—Chapman, New Zealand Geol. Surv., Pal. Bull., No. 11, 1926, p. 84, pl. 17, fig. 1.—Casasnovas, Not. Y Res. Instit. Ocean, ser. 2, No. 29, 1928, p. 8.—Martinotti, Atti Soc. Ital. Sci. Nat., vol. 68, 1929, p. 4.

Test almost equally biconvex, peripheral margin acute, often slightly lobulated, carinate; chambers usually 7 or 8 in the last-formed whorl, distinct, not inflated, increasing rather evenly in size as added, the ventral side somewhat truncated; sutures distinct, limbate on both surfaces, the dorsal ones gently curved, ventral ones nearly radial; wall smooth except for the slightly raised sutures on the dorsal side, finely perforate, the final chamber often with large pores; aperture about midway between the umbilicus and peripheral margin on the ventral side.

Diameter up to 2 mm.

This species has been very widely recorded especially in warm waters but there are records for it in cooler waters although there are comparatively few of these. In the West Indian region it often is very common and well developed. There is a certain amount of variation but the general characters are closely held and it is not likely to be taken for any other species. As already noted, it is probably closely related to the form usually known as "*Pulvinulina lateralis* (Terquem)" which is often associated with it.

This species of Fichtel and Moll was taken by Montfort as the type of his genus *Eponides* as well as much later for *Pulvinulina* by Parker and Jones. Under these circumstances there can be little question as to the use of *Eponides* as a genus.

Eponides repanda—Material examined

Catalogue No.	Collection of	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
			Albatross	° ′ ″ ° ′ ′				
21684	U.S.N.M.	1	D2112	35 20 50 N.; 75 18 00 W.	16	73.5	s., blk. sp.	Rare.
21685	U.S.N.M.	1	D2318	24 25 45 N.; 81 46 00 W.	45	75	co.	Do.
21686	U.S.N.M.	1	D2758	6 59 00 S.; 34 47 00 W.	20	79	brk. sh.	Do.
21687	U.S.N.M.	1		Off Fowey, Fla.	22			Do.
12962	J.A.C.	2		do.	35			Do.
21688	U.S.N.M.	3		do.	40			Do.
21689	U.S.N.M.	1		do.	52			Do.
21690	U.S.N.M.	1		do.	70			Do.
12963	J.A.C.	1		Off Ragged Key, Fla.	85			Do.
12964	J.A.C.	2		Off Sand Key, Fla.	38			Do.
3072	J.A.C.	1	6	Dry Tortugas, Fla.	7	23° C.	m.	Do.
3077	J.A.C.	1	12	do.	7		hrd.	Do.
3068	J.A.C.	3	13	do.	11		fne. s.	Do.
3078	J.A.C.	1	21	do.	6		fne. s.	Do.
3070	J.A.C.	1	22	do.	6		fne. s.	Do.
3069	J.A.C.	1	23	do.	10.5		m. s.	Do.
3071	J.A.C.	4	24	do.	3.5		crs. s.	Few.
3074	J.A.C.	1	28	do.	4.75		fne. s.	Rare.
3076	J.A.C.	1	30	do.	2		s.	Do.
3073	J.A.C.	1	37	do.	11		fne. s.	Do.
3075	J.A.C.	1	42	do.	18		s.	Do.
				° ′ ″ ° ′ ″				
12965	J.A.C.	5	*Goldseeker*	58 44 00 N.; 7 00 00 W.				Common.
21691	U.S.N.M.	7						
12966	J.A.C.	7	*Goldseeker*	58 44 00 N.; 5 00 00 W.				Do.
21692	U.S.N.M.	8						
21693	U.S.N.M.	5						
21694	U.S.N.M.	3	*Goldseeker*	Off Noss Head, Moray Firth.				Rare.
21695	U.S.N.M.	1	*Goldseeker*	North Sound, Orkney Ids.				Do.

EPONIDES REPANDA (Fichtel and Moll), var. CONCAMERATA (Williamson)

Plate 11, figures 4 *a–c*

Serpula concamerata Montagu, Test. Brit., Suppl., 1808, p. 160 (fide Williamson).

Rotalina concamerata Williamson, Rec. Foram. Gt. Britain, 1858, p. 52, pl. 4, figs. 101–103 (not 104, 105).

Pulvinulina repanda, var. *concamerata* H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 685, pl. 104, figs. 19 *a–c*.—Halkyard, Trans. Manchester Micr. Soc., 1889, p. 70.—Heron-Allen and Earland, Proc. Roy. Irish Acad., vol. 31, pt. 64, 1913, p. 134; Trans. Linn. Soc. London, ser. 2, vol. 11, 1916, p. 275; Journ. Roy. Micr. Soc., 1916, p. 51; 1930, p. 188.

This circular and somewhat umbilicate form with a considerable degree of ornamentation has been recorded from the waters off western Europe and elsewhere. I have given the records for this region above. It may be as widely distributed as the typical form, but I have failed to find it in the western Atlantic where the typical is often common. The figures are after the originals of Williamson. Brady's *Challenger* figures are from a *Porcupine* station off the British Isles, and may be considered typical of the variety.

EPONIDES SCHREIBERSII (d'Orbigny)

There are numbers of records for this species from the western Atlantic. In 1846, d'Orbigny described this species from the Miocene of the Vienna Basin, and it is evidently found living in the Mediterranean and in the Indo-Pacific. If our identification of d'Orbigny's "*Rosalina antillarum*" is correct probably the records of "*Pulvinulina schreibersii*" from the western Atlantic should belong to the earlier species. I have examined Goës's material from the Gulf of Mexico, and while the specimens have a higher spire than is usual, they are probably *antillarum*. Brady, Parker, and Jones figure a high-spired form from the Abrohlos Bank of Brazil as *schreibersii* and Brady records it from a *Challenger* station in 435 fathoms off Bermuda. All his other records are from the Indo-Pacific. Both dorsal and ventral sides show differences when compared with topotype material from the Vienna Basin, and further study will probably show that there are two distinct forms, the West Indian one being different from that of the Miocene one of the Vienna Basin.

EPONIDES UMBONATA (Reuss)

Plate 11, figures 1–3

Rotalina umbonata Reuss, Zeitschr. deutsch. geol. Ges., vol. 3, 1851, p. 75, pl. 5, figs. 35 *a–c*.

Pulvinulina umbonata Reuss, Denkschr. Akad. Wiss. Wien, vol. 25, 1866, p. 206; Sitz. Akad. Wiss. Wien, vol. 62, 1870, p. 490.—v. Schlicht, Foram. Septar. Pietzpuhl, 1870, pl. 20, figs. 20–22, 26–28.—Hantken, Mitth. Jahrb. k. Ungar. Geol. Anstalt, vol. 4, 1875 (1881), p. 77, pl. 9, figs. 8 *a–c*.—Terrigi, Atti Accad. Pont. Nuovi Lincei, vol. 35, 1883, p. 200, pl. 4, figs. 45, 46.—H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 695, pl. 105, figs. 2 *a–c;* Quart. Journ. Geol. Soc., vol. 44, 1888, p. 9.—Mariani, Atti Soc. Ital. Sci. Nat., vol. 31, 1888, p. 126.—Egger, Abhandl. kön. bay. Akad. Wiss. München, Cl. II, vol. 18, 1893, p. 410, pl. 18, figs. 19–21.—Silvestri, Atti Accad. Sci. Acireale, vol. 7, 1896, p. 87.—Flint, Ann. Rep't. U. S. Nat. Mus., 1897 (1899), p. 330, pl. 74, fig. 4.—Liebus, Jahrb. geol. Reichs., vol. 52, 1903, p. 84.—Dakin, Rep't. Pearl Oyster Fish. Ceylon, 1906, p. 239.—Heron-Allen and Earland, Journ. Roy. Micr. Soc., 1911, p. 341.—Schubert, Abhandl. geol. Reichs., vol. 20, pt. 4, 1911, p. 112.—Pearcey, Trans. Roy. Soc. Edinburgh, vol. 49, 1914, p. 1029.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 5, 1915, p. 60, pl. 27, fig. 2.—Klähn, Mitth. Naturhist. Ges. Colmar, vol. 14, 1916–17 (1920), p. 56.—CUSHMAN, 13th Ann. Rep't. Florida Geol. Survey, 1921, p. 52; Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 339, pl. 71, figs. 1 *a–c*.—CLODIUS, Archiv. Ver. Freunde Nat. Mecklenburg, 75 Jahr., 1922, p. 136.—HERON-ALLEN and EARLAND, British Antarctic Exped., Zoology, vol. 6, 1922, p. 216.—MARTINOTTI, Atti Soc. Ital. Sci. Nat., vol. 62, 1923, p. 351, pl. 7, figs. 65–67.—CHAPMAN, New Zealand Geol. Survey, Pal. Bull., No. 11, 1926, p. 84, pl. 17, fig. 3.

Eponides umbonata COLE, Bull. Amer. Pal., vol. 14, No. 53, 1928, p. 215 (15), pl. 2, fig. 6.—CUSHMAN, Contr. Cushman Lab. Foram. Res., vol. 5, 1929, p. 98, pl. 14, figs. 8 *a–c*.

Rotalia umbonata GALLOWAY and MORREY, Bull. Amer. Pal., vol. 15, No. 55, 1929, p. 26, pl. 4, figs. 1 *a–c*.

Truncatulina tenera H. B. BRADY, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 665, pl. 95, figs. 11 *a–c*.—EGGER, Abhandl. kön. bay. Akad. Wiss. München, Cl. II, vol. 18, 1893, p. 402, pl. 16, figs. 45–47.—CHAPMAN, Proc. Zool. Soc. London, 1895, p. 41.—DAKIN, Rep't. Pearl Oyster Fish. Ceylon, 1906, p. 238.—CHAPMAN, Journ. Linn. Soc. Zool., vol. 30, 1910, p. 421.—PEARCEY, Trans. Roy. Soc. Edinburgh, vol. 49, 1914, p. 1027.—CHAPMAN, Biol. Res. *Endeavour*, vol. 3, 1915, p. 30.—CUSHMAN, Bull. 71, U. S. Nat. Mus., pt. 5, 1915, p. 37, pl. 16, fig. 2; pl. 23, fig. 6.—CHAPMAN, Rep't. British Antarctic Exped. Geol., vol. 2, 1916 (1917), p. 70, pl. 4, fig. 38.— SIDEBOTTOM, Journ. Roy. Micr. Soc., 1918, p. 257.—HALKYARD, Mem. Proc. Manchester Lit. Philos. Soc., vol. 62, pt. 2, 1918 (1919), p. 118.— CUSHMAN, Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 318, pl. 64, figs. 2 *a–c*.—HERON-ALLEN and EARLAND, British Antarctic Exped., Zool., vol. 6, 1922, p. 211.—HANZAWA, Jap. Journ. Geol. Pal., vol. 4, 1925 (1926), p. 43.—YABE and HANZAWA, Jap. Journ. Geol. Pal., vol. 4, 1925 (1926), p. 52.—CHAPMAN, New Zealand Geol. Survey, Pal. Bull., No. 11, 1926, p. 78, pl. 15, figs. 14 *a,b*.—PLUMMER, Bull. 2644, Univ. Texas, 1927, p. 146, pl. 9, figs. 5 *a–c*.

Rotalia ecuadorensis GALLOWAY and MORREY, Bull. Amer. Pal., vol. 15, No. 55, 1929, p. 26, pl. 3, figs. 13 *a–c*.

Test biconvex, varying much in relative amount in different specimens, periphery acute to rounded; chambers distinct, from five in the young and megalospheric forms to eight in the adult microspheric form, very little inflated, increasing uniformly in size as added; sutures distinct, those of the dorsal side in the young straight and nearly radial, in the adult slightly oblique, on the ventral side usually with a characteristic sigmoid curve; wall smooth, very finely perforate; aperture usually about midway between the periphery and umbilical region of the ventral side, often with a slightly thickened border or even a slight lip.

Diameter up to 1.10 mm. in the microspheric form.

This is a widely distributed species of comparatively long range, appearing early in the Tertiary and widely distributed in the present oceans. Reuss originally described it from the Oligocene of Germany where it is often very abundant. It has occurred commonly in some of the *Albatross* dredgings as recorded in the accompanying table.

There is apparently a wide range of variation in some of the characters but this may be due to age and the microspheric and megalospheric forms. The sutures on the dorsal side in the early stages are straight and radial while in the adults they often become slightly oblique. The characteristic sigmoid sutures on the ventral side may be somewhat obscured but are usually evident especially at the inner end.

Brady's figures of "*Truncatulina tenera*" are much more characteristic of the species than those he assigns to "*Pulvinulina umbonata*." It should be noted that Flint's specimens referred to "*Truncatulina tenera*" belong to *Anomalina*, and those assigned by Heron-Allen and Earland in 1916 to this species are not identical.

Eponides umbonata—Material examined

Cat. No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
			Albatross	° ′ ″ ° ′ ″				
21696	U.S.N.M.	1	D2035	39 26 16 N.; 70 02 37 W	1, 362	------	glob. oz	Rare.
21697	U.S.N.M.	1	D2037	38 53 00 N.; 69 23 30 W	1, 731	38	glob. oz	Do.
21698	U.S.N.M.	1	D2042	39 33 00 N.; 68 26 45 W	1, 555	38. 5	glob. oz	Do.
21699	U.S.N.M.	2	D2097	37 56 20 N.; 70 57 30 W	1, 917	------	glob. oz	Do.
21700	U.S.N.M.	1	D2138	17 44 05 N.; 75 39 00 W	23	------	co. brk. sh	Few.
21701	U.S.N.M.	4						
21702	U.S.N.M.	6	D2144	9 49 00 N.; 79 31 30 W	896	------	gn. m	Do.
21703	U.S.N.M.	1	D2150	13 34 45 N.; 81 21 10 W	382	45. 8	wh. crs. s	Rare.
21704	U.S.N.M.	1	D2335	23 10 39 N.; 82 20 21 W	204	------	------	Do.
21706	U.S.N.M.	7	D2535	40 03 30 N.; 67 27 15 W	1, 149	37. 8	gy. oz	Common.
21707	U.S.N.M.	1	D2563	39 18 30 N.; 71 23 30 W	1, 422	37. 4	gy. oz	Rare.
21708	U.S.N.M.	1	D2639	25 04 50 N.; 80 15 10 W	56	------	co. s	Do.
21709	U.S.N.M.	1	D2641	25 11 30 N.; 80 10 00 W	60	69. 2	co. s	Do.
21710	U.S.N.M.	1	D2644	25 40 00 N.; 80 00 00 W	193	43. 4	gy. s	Do.
21711	U.S.N.M.	1	D2679	32 40 00 N.; 76 40 30 W	782	38. 6	lt. gy. oz	Do.
21712	U.S.N.M.	1	D2714	38 22 00 N.; 70 17 30 W	1, 825	------	br. oz	Do.
21713	U.S.N.M.	1	D2716	38 29 30 N.; 70 57 00 W	1, 631	------	br. oz., for	Do.
21714	U.S.N.M.	2	D2754	11 40 00 N.; 58 33 00 W	880	38	glob. oz	Do.
21715	U.S.N.M.	4	D2763	24 17 00 S.; 42 48 30 W	671	37. 9	br. glob. oz	Few.

EPONIDES UMBONATA (Reuss), var. **EHRENBERGII** (Bailey)

Plate 9, figures 3 *a–c*

Rotalina ehrenbergii Bailey, Smithsonian Contrib., vol. 2, art. 3, 1851, p. 10, pl., figs. 11–13.

Variety differing from the typical in the larger size, the more rounded periphery and the greater number of chambers.

Eponides umbonata, var. *ehrenbergii—Material examined*

Cat. No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
			Albatross	° ′ ″ ° ′ ″				
21716	U.S.N.M.	3	D2106	37 41 20 N.; 73 03 20 W	1, 497	42. 5	glob. oz	Rare.
21717	U.S.N.M.	6	D2038	38 30 30 N.; 69 08 25 W	2, 033	------	glob. oz	Few.
21718	U.S.N.M.	10+	D2039	38 19 26 N.; 68 20 20 W	2, 369	------	glob. oz	Abundant.
21719	U.S.N.M.	7	D2041	39 22 50 N.; 68 25 00 W	1, 608	38	glob. oz	Common.
21720	U.S.N.M.	4	D2042	39 33 00 N.; 68 26 45 W	1, 555	38. 5	glob. oz	Few.
21721	U.S.N.M.	1	D2192	39 46 30 N.; 70 14 45 W	1, 060	38. 6	gy. oz	Rare.

This variety is very common in the *Albatross* dredgings off the eastern coast of the United States where Bailey obtained his original material. The specimens are very distinct from the typical.

Brady placed Bailey's species as a synonym of his "*Truncatulina haidingerii* d'Orbigny" which is not the same as d'Orbigny's species.

EPONIDES (?) TUBERCULATA (Balkwill and Wright)

Plate 11, figures 5 *a–c*

Discorbina tuberculata Balkwill and Wright, Trans. Roy. Irish Acad., vol. 28, Sci., 1885, p. 350, pl. 13, figs. 28–30.—Siddall, Proc. Lit. Philos. Soc., Liverpool, 1886, p. 70.—Halkyard, Trans. Manchester Micr. Soc., 1889, p. 16, pl. 2, fig. 10 (?).—Chaster, First Rep't. Southport Soc. Nat. Sci., 1890–91 (1892), p. 65.—Earland, Journ. Quekett Micr. Club, ser. 2, vol. 9, 1915, p. 224.—Sidebottom, Mem. Proc. Manchester Lit. Philos. Soc., vol. 52, No. 13, 1908, p. 15, pl. 5, fig. 5; vol. 54, No. 16, 1910, p. 25.—Heron-Allen and Earland, Proc. Roy. Irish Acad., vol. 31, pt. 64, 1913, p. 127; Trans. Zool. Soc. London, vol. 20, 1915, p. 695; Journ. Roy. Micr. Soc., 1916, p. 50.—Sidebottom, Journ. Roy. Micr. Soc., 1918, p. 254.—Heron-Allen and Earland, British Antarctic Exped., Zoology, vol. 6, 1922, p. 233; Journ. Roy. Micr. Soc., 1930, p. 184.

"Test, trochoid, convex superiorly and inferiorly, with about two convolutions, which are visible on the superior side. The outermost convolution shows about six chamberlets. On the superior side these are separated by deeply constricted lines, and the surface of the chamberlets is roughened by a number of coarse tubercles which to a great extent obscure the septal lines. On the inferior side, the outermost convolution alone is visible. This side is usually smooth, but a few tubercles sometimes occur upon it. Aperture, a slit near the umbilicus, close to the inferior surface of the preceding convolution."

This is a peculiar species with a highly ornamented surface. Most of the records are from the region of the British Isles and the Mediterranean, although it has been recorded from the Kerimba Archipelago by Heron-Allen and Earland, off Australia by Sidebottom, and from off the coast of Brazil, 22° 56′ S.; 41° 34′ W. in 40 fathoms by Heron-Allen and Earland.

The figures and description are from the originals of Balkwill and Wright.

EPONIDES TUMIDULA (H. B. Brady)

Plate 11, figures 6 *a, b*

Truncatulina tumidula H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 666, pl. 95, figs. 8 *a–d*.—Pearcey, Trans. Roy. Soc. Edinburgh, vol. 49, 1914, p. 1028.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 5, 1915, p. 38, pl. 15, fig. 3.—Heron-Allen and Earland, British Antarctic Exped., Zoology, vol. 6, 1922, p. 211.

"Test trochoid, more or less depressed; consisting of three convolutions, the last of which is composed of about six segments; superior face highly convex; inferior less convex, slightly excavated at the umbilicus; peripheral edge thick and lobulated; segments inflated, especially those of the final convolution. Colour deep brown, except the terminal segment, which is generally of lighter hue. Diameter, 1/30 inch (0.2 mm.)."

The only *Challenger* record for this species is the type station, No. 5, southwest of the Canaries, 2,740 fathoms. Similar forms have been recorded from the Antarctic and from the Pacific.

The description and figures are from Brady.

EPONIDES WRIGHTII (H. B. Brady)

Plate 11, figures 7, 8

Discorbina parisiensis J. WRIGHT (part) (not d'Orbigny), Proc. Belfast Nat. Field Club, 1876–77 (1877), App. p. 105, pl. 4, fig. 2 *a–c*.

Discorbina wrightii H. B. BRADY, Denkschr. Kais. Akad. Wiss., Math.-Nat. Cl., vol. 43, 1881, p. 16, pl. 2, figs. 6 *a*, *b*.—BALKWILL and WRIGHT, Trans. Roy. Irish Acad., vol. 28, Sci., 1885, p. 350.—HALKYARD, Trans. Manchester Micr. Soc., 1889, p. 16, pl. 2, fig. 9.—CHASTER, First Rep't. Southport Soc. Nat. Sci., 1890–91 (1892), p. 65.—WRIGHT, Irish Nat., vol. 9, 1900, p. 55.—EARLAND, Journ. Quekett Micr. Club, ser. 2, vol. 9, 1905, p. 223.—MILLETT, Rec. Foram. Galway, 1908, p. 6.—HERON-ALLEN and EARLAND, Journ. Roy. Micr. Soc., 1909, p. 443; Proc. Roy. Irish Acad., vol. 31, pt. 64, 1913, p. 131, pl. 12, fig. 4; Journ. Roy. Micr. Soc., 1916, p. 51; 1930, p. 186.

Wright figured two distinct things in his paper referred to above. The second of these was placed by Brady in his *Discorbina wrightii*. It has a trochoid test, the ventral side concave, and a stellate form in the umbilical region. The ventral side is marked by beads in radial lines. Brady's figure of a specimen from Nova Zembla is given here, and seems to be an *Eponides*. It may be noted that the form described by Heron-Allen and Earland as "*Discorbina baccata*" from the Clare Island region very strongly resembles Wright's original figure. Their description mentions the beads of the ventral surface arranged in radial lines, but their figure does not show this clearly. The umbilical stellate ornamentation is very clearly similar in the two, and the dorsal and side views are very close.

Eponides wrightii—Material examined

Cat. No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
2757	J.A.C.	1	------	S. of Black Whale Harbor, Hudson Bay.	10	------	s., g., m	Rare.
2756	J.A.C.	1	------	Richmond Gulf, Hudson Bay	15–20	------	s., st	Do.
2755	J.A.C.	1	------	James Bay, Hudson Bay	4–5	------	s., g., st	Do.

Genus PLANOPULVINULINA Schubert, 1920

Planopulvinulina SCHUBERT, Pal. Zeitschr., vol. 3, 1920, p. 153.—CUSHMAN, Special Publ. No. 1, Cushman Lab. Foram. Res., 1928, p. 273.
Pulvinulina (part) H. B. BRADY, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 687.

Genotype, by designation.—*Pulvinulina dispansa* H. B. Brady.

Test trochoid in the early stages, later becoming very irregular in form but the chambers not annular; ventral face of the chambers with large pores which apparently serve as the apertures.

Late Tertiary and Recent.

This is apparently a genus which has its nearest relationships, as suggested by Brady, with *Eponides punctulata* (d'Orbigny). With it, Schubert included *Planorbulina vermiculata* d'Orbigny, a form closely related to *Cibicides* and later made the genotype of *Cyclocibicides* Cushman. The development and relationships of the two forms are very different.

PLANOPULVINULINA DISPANSA (H. B. Brady)

Plate 15, figures 3 *a*, *b*

Pulvinulina dispansa H. B. BRADY, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 687, pl. 115, figs. 3 *a–c*.—WOODWARD, The Observer, vol. 4, 1893, p. 177.
Planopulvinulina dispansa SCHUBERT, Pal. Zeitschr., vol. 3, 1920, p. 153.—CUSHMAN, Special Publ. No. 1, Cushman Lab. Foram. Res., 1928, p. 273, pl. 53, fig. 18.

"Test adherent (or free?), spreading, outline irregularly lobulated; composed of numerous segments of various sizes and shapes, arranged in an obscure, depressed, irregular, Rotaliform spire. Superior surface beset with minute exogenous beads or tubercles; inferior smooth, coarsely perforated. Aperture indistinct. Diameter, one-sixth inch (4 mm.), or more."

Brady's types are from off Madeira. He also records less typical specimens from *Challenger* Station 24, off Culebra Island, West Indies, 390 fathoms.

Goës records the species from off the Azores, but his figures show that the specimens he had are not the same as this species. Koch records it from the Middle Tertiary of East Borneo with considerable question.

Genus ROTALIA Lamarck, 1804

Rotalia LAMARCK, Ann. Mus., vol. 5, 1804, p. 184.—H. B. BRADY (part), Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 702.—CHAPMAN (part), The Foraminifera, 1902, p. 223.—CUSHMAN, Special Publ. No. 1, Cushman Lab. Foram. Res., 1928, p. 273.
Nautilus (part) of AUTHORS.
Streblus FISCHER, Mém. Soc. Imp. Nat. Moscou, vol. 5, 1817, p. 449 (genoholotype, *Streblus tortuosus* Fischer).

Turbinulina d'Orbigny, Ann. Sci. Nat., vol. 7, 1826, p. 275 (genotype, by designation, *Rotalia* (*Turbinulina*) *beccarii* (Linnaeus) = *Nautilus beccarii* Linnaeus).
Rosalina (part) of Authors.
Truncatulina (part) of Authors.

Genoholotype.—Rotalia trochidiformis Lamarck.

Test trochoid, usually biconvex, the umbilical area closed, usually having a conical plug of clear shell material; sutures on the ventral side usually deeply depressed and often ornamented along the sides, dorsal side usually limbate; wall calcareous, perforate, often double; aperture, an arched opening at the border of the ventral face midway between the periphery and the umbilical area, interseptal canals sometimes present.

Cretaceous to Recent.

As restricted by the above description, *Rotalia* in the Atlantic is represented by a very few species.

ROTALIA BECCARII (Linnaeus)

Plate 12, figures 1–7; plate 13, figures 1, 2

"Cornu Hammonis" Plancus, Conch. Min., 1739, p. 8, pl. 1, fig. 1.

"Ammonia unita" Gualtieri, Index Test., 1742, pl. 19, figs. H, I.

Nautilus beccarii Linnaeus, Syst. Nat., ed. 12, 1767, p. 1162; ed. 13 (Gmelin's) 1788, p. 3370.

Streblus beccarii Fischer, Advers. Zool., fasc. 2, 1819, p. 75.

Rotalia (*Turbinulina*) *beccarii* d'Orbigny, Ann. Sci. Nat., vol. 7, 1826, p. 275 No. 42; Modéles, No. 74.

Discorbula ariminensis Lamarck, Tabl. Encycl. et Méth., 1816, pl. 466, figs. 6 *a*, *b*.

Rotalina beccarii Williamson, Rec. Foram. Gt. Britain, 1858, p. 48, pl. 4, figs. 90–92.

In "Contributions from the Cushman Laboratory for Foraminiferal Research," [24] I have given an account of this species and a discussion of the various stages of its development which is given below.

Brady in the *Challenger* Report (pp. 704–705) gives the following very excellent description: "*Rotalia beccarii*, the central species of the genus from a morphological point of view, and by far the best known, is not well represented in the *Challenger* collections.

"In its typical presentment the test forms a depressed turbinoid spire, the two faces of which are nearly equally convex, and the peripheral edge rounded and more or less lobulated. The segments, which are numerous and a little inflated, are arranged in three to four convolutions; on the superior side the sutures are flush or very slightly depressed, and marked by the broad lines of the thick clear septa within; whilst on the inferior they are irregularly excavated, and their borders, as well as the umbilical portion of the surface, are studded with irregular exogenous granules. The septa of well-developed typical shells are double."

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[24] Vol. 4, 1928, pp. 103–107, pl. 15, figs. 1–7.

This is a very good general description of the species as it occurs at its type locality at Rimini. The description should go further however, and the series of figures given will illustrate the further points. Figure 3 is of a megalospheric specimen with a large proloculum, that has ten chambers, and although this is a young specimen, the characters show the smooth surfaces, and the sutures on the ventral side without the ornamentation seen in older specimens. Six chambers make up a whorl, and the central plug of the umbilical area is not developed. The ending of the chambers on the ventral side is somewhat similar to *Discorbis.*

Figure 4 shows a specimen with a microspheric proloculum and 18 chambers. There are eight chambers in the whorl although but six in the earlier stages. There is a definite development of the central plug of the ventral side, but beading of the sutures is not yet developed.

Figure 5 shows a microspheric specimen that has 21 chambers, nine making up the last-formed whorl. The central plug is already somewhat ornate, and there is a tendency for the sutures to open up and become beaded.

Figure 6 shows a specimen with more chambers than the preceding, probably microspheric but as the dorsal side is covered with secondary shell material, it is difficult to make out the early chambers. The central plug has become enlarged and the sides of the sutures on the ventral side are decidedly beaded and fluted. There are 11 chambers in the last-formed whorl.

Figure 7 shows an adult microspheric specimen in which the covering of the central part of the dorsal side of the test is carried much further than the preceding. The ventral plug is broken into several large bosses at the surface. The sutures are heavily beaded aud fluted. The last-formed coil has 13 chambers, nearly double that of the younger individuals. Specimens of this general form are very abundant at Rimini. The difference in relative thickness of the test is also shown in the peripheral views, the young stages being much thicker in proportion than the adult.

A comparison of these figures with those given by different authors from various parts of the world will show the wide deviation from this typical form. A study of fossil and Recent Rotalias related to *R. beccarii* should prove useful as numerous varieties or species will be found with definite distributions and the true *R. beccarii* will be found to have a rather restricted area.

This species is splendidly developed in the Adriatic and like others of that region is also found along the coasts of western Europe. Plate 13, figure 2 shows a specimen from the Belgian coast. I have not seen any Atlantic material equal in size and number of chambers equal to the very large and beautiful specimens that are found at the type locality of Rimini on the Adriatic.

There are a great many references to this species, but they are not included here as certainly more than a single species is involved, and it is difficult to make sure of the forms unless the original specimens can be studied.

In the West Indian region I have specimens that can be referred here, but from one locality off Biscayne Bay, Fla., where it is common. It never develops the extreme form of typical *beccarii*.

From the New England coast I have abundant specimens of a form that seems best referred to *beccarii*, but also is smaller. In the brackish water of the upper end of Buzzards Bay there is a small form with very peculiar pointed ends to the chambers and with other characters that may prove to be of some distinction, but it is necessary to be sure that this is not due to the conditions under which it lives.

Rotalia beccarii—Material examined

Cat. No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom perature	Character of bottom	Abundance
21722	U.S.N.M.	1	*Albatross* D 2112	° ′ ″ ° ′ ″ 35 20 50 N.; 75 18 00 W.	16	73.5	s., blk. sp.	Rare.
21723	U.S.N.M.	10+		Off Biscayne Bay, Fla.				Abundant.
12967	J.A.C.	10+						
12968	J.A.C.	1		Off Woods Hole, Mass.				Rare.
12969	J.A.C.	6		Newport Beach, Newport, R. I.				Common.
12970	J.A.C.	2						
12971	J.A.C.	9		Off Pocasset, Buzzards Bay, Mass.				Abundant.
12972	J.A.C.	10+		do.				Do.
12973	J.A.C.	10		do.				Do.
12974	J.A.C.	1		do.				Do.
12975	J.A.C.	1		do.				Do.
12976	J.A.C.	10+		do.				Do.
12977	J.A.C.	4		Bathing Beach, Buzzards Bay, Mass.				Few.
12978	J.A.C.	10+		Nantasket Beach, Mass.				Abundant.
12979	J.A.C.	2		Revere Beach, Mass.				Rare.
12980	J.A.C.	7		Hampton Beach, N.H.				Common.
12981	J.A.C.	1		Harpswell Sound, Casco Bay, Me.				Rare.
12982	J.A.C.	1		Grace Holman Harbor, Norway.	2.5			Do.
12983	J.A.C.	10+	*Flying Falcon* Log. 8	10 mi. S. of Glencoe, Ireland.	53			Abundant.
12984	J.A.C.	6	*Lord Bandon* Log. 42	Off Bantry Bay, S. W. Ireland.	37.5			Few.
12985	J.A.C.	2	Log. 33	S. of Cork Harbor, Ireland.	52.5			Rare.
12986	J.A.C.	10+	Log. 39	Off County Cork, Ireland.	20			Abundant.
12987	J.A.C.	10+	*Goldseeker* Haul 23	Arnish Point, off The Minch.				Do.
21724	U.S.N.M.	1	*Goldseeker*	° ′ ″ ° ′ ″ 61 34 00 N.; 2 4 00 E.				Rare.

ROTALIA BECCARII (Linnaeus), var. TEPIDA Cushman

Plate 13, figures 3 *a–c*

Rotalia beccarii (Linnaeus), var. *tepida* Cushman, Publ. 344, Carnegie Instit., Washington, 1926, p. 79, pl. 1.

Test small, almost equally biconvex, the dorsal side slightly more than the ventral, chambers 6 or 7 in the last-formed whorl; peripheral margin rounded; sutures slightly limbate above, ventrally much depressed; toward the umbilicus the chambers separated, forming angular, open spaces, the ends of the chambers extended to a point; wall smooth, finely punctate; aperture, a narrow slit beneath the inner angle of the last-formed chamber, often supplemented by a nearly circular, small opening near the base of the ventral face of the last-formed chamber.

Diameter not over 0.35 mm.

This variety is common in warm protected waters in the West Indian region. I collected it at numerous stations in San Juan Harbor, P. R., and at Ponce on the southern side of the same island. It occurred at three stations in my Tortugas material, two in the warm, shallow, stagnant water of the moat at Fort Jefferson, Garden Key, and the other on Long Key in a tide pool where the water at low tide was very warm. It is probably to be found widely distributed in the West Indian region in such habitats.

Rotalia beccarii, var. *tepida*—*Material examined*

Cat. No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
3137	J.A.C.	3	6	Dry Tortugas, Fla	1		m	Abundant.
3139	J.A.C.	10+						
3140	J.A.C.	10+	8	do	1		m	Do.
3138	J.A.C.	1	9	do	1		m	Rare.
3147	J.A.C.	10	1	San Juan Harbor, P. R	5			Abundant.
3146	J.A.C.	10+	2	do	3			Do.
3145	J.A.C.	10+	4	do	1			Do.
3144	J.A.C.	10+	5	do	3			Do.
12988	J.A.C.	1	5	do	3			Do.
3143	J.A.C.	5	6	do	1.5			Few.
13142	J.A.C.	2	7	do	2.5			Rare.
3142	J.A.C.	5	8	do	2			Common.
3141	J.A.C.	10+	9	Ponce, P. R	.5			Abundant.

ROTALIA ROSEA d'Orbigny

Plate 13, figures 5 *a–c*

Rotalia rosea d'Orbigny, Ann. Sci. Nat., vol. 7, 1826, p. 272, No. 7; Modèles No. 36.—Parker, Jones, and H. B. Brady, Ann. Mag. Nat. Hist., ser. 3, vol. 16, 1865, p. 24, pl. 3, figs. 7–9.—Cushman and Kellett, Proc. U. S. Nat. Mus., vol. 75, art. 25, 1929, p. 13, pl. 4, figs. 2, 3.

Rotalina rosea d'Orbigny, in De la Sagra, Hist. Fis. Pol. Nat. Cuba, 1839, "Foraminifères," p. 72, pl. 3, figs. 9–11.

Truncatulina rosea H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 667, pl. 96, fig. 1.—Flint, Ann. Rep't U. S. Nat. Mus., 1897 (1899), p. 334 pl. 78, fig. 2; Bull. U. S. Fish Commission No. 484, 1900, p. 416.—Cushman, Proc. Boston Soc. Nat. Hist., vol. 34, No. 2, 1908, p. 30; Proc. U. S. Nat. Mus., vol. 59, 1921, p. 56, pl. 13, figs. 1–3; Publ. 311, Carnegie Instit., Washington, 1922, p. 46, pl. 14, figs. 3–5; Publ. 344, 1925, p. 78.

Test trochoid, biconvex, the dorsal side often with a high spire, periphery acute, or with small spinose projections or with irregular plate-like extensions at each chamber, umbilical area with a distinct plug; chambers usually 9 to 10 in the last-formed whorl, increasing gradually in size as added, not inflated; sutures limbate but not raised, oblique on the dorsal side, nearly radial on the ventral side, flush on the dorsal side, depressed on the ventral side; wall coarsely perforate, smooth or ornamented with beadlike projections, especially near the periphery; aperture, an elongate slit at the inner margin of the ventral side of the chamber, with a considerable lip developed above it, color rose-red to reddish-brown.

Diameter averaging about 0.40 mm.

This is a very common West Indian species, and seems to be restricted to this region and the northern coast of South America,on both the Atlantic and Pacific sides. d'Orbigny originally described it from Cuba, Martinique, Guadaloupe, St. Thomas, Jamaica, and Haiti. I have had it from a few *Albatross* stations as shown in the table, and it has occurred in the Woods Hole region as very rare. It occurred rarely at Porto Rico and on the north coast of Jamaica. Egger records it from the region of western Australia, but his figures have nothing in common with this species. The record of Heron-Allen and Earland from the Kerimba Archipelago is also open to much question, as it was said to resemble that of Egger's figure rather than d'Orbigny's model.

Dr. W. L. Schmitt collected it at Santa Elena, Ecuador, where it is fairly common.

In the West Indian region, it is common in shallow water, and the specimens obtained in deeper water by the *Albatross* show polished and eroded surfaces as though they had passed through the digestive tract of some animal.

There are a few other records for *Rotalia* from the Atlantic that may be noted.

Rotalia rosea—Material examined

Catalogue No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
			Albatross	° ′ ″ ° ′ ″				
21725	U.S.N.M.	7	D2358	20 19 00 N.; 87 03 30 W	222		fne. wh. co.	Common.
21726	U.S.N.M.	7	D2388	29 24 30 N.; 88 01 00 W	35		yl. s., bk. sp.	Do.
21727	U.S.N.M.	1	D2629	23 48 40 N.; 75 10 40 W	1169	38.4	co. s	Rare.
2928	J.A.C.	1	4	Dry Tortugas, Fla	1		dead coral	Do.
2929	J.A.C.	9	6	do	1		m	Common.
2924	J.A.C.	6	8	do	1		m	Few.
2923	J.A.C.	10+	9	do	1		m	Abundant.
2926	J.A.C.	3	9	do	1		m	Do.
						°C.		
2922	J.A.C.	3	12	do	7	23	hrd	Rare.
2921	J.A.C.	1	18	do	7		fne. s	Do.
2913	J.A.C.	1	19	do	5.75		fne. s	Do.
2914	J.A.C.	1	20	do	7		fne. s	Do.
2915	J.A.C.	10+	21	do	6		fne. s	Abundant.
2917	J.A.C.	8	22	do	6		fne. s	Common.
2916	J.A.C.	3	23	do	10.5		m. s	Rare.
2919	J.A.C.	10+	24	do	3.5		crs. s	Abundant.
2918	J.A.C.	3	27	do	7		m	Rare.
2925	J.A.C.	2	28	do	4.75		fne. s	Do.
2920	J.A.C.	4	30	do	2		s	Few.
2927	J.A.C.	3	37	do	11		fne. s	Rare.
21728	U.S.N.M.	2		Off Biscayne Bay, Fla	16–34			Do.
21729	U.S.N.M.	1		Off Ajax Reef, Fla	40			Do.
2933	J.A.C.	6		Nassau Harbor, Bahamas				Few.
12989	J.A.C.	2		Off Morro Castle, Havana, Cuba				Rare.
9962	J.A.C.	10+		Havana Harbor, Cuba				Abundant.
2932	J.A.C.	7		Runaway Bay, Jamaica				Common.
2931	J.A.C.	9		Montego Bay, Jamaica	3			Do.
2934	J.A.C.	2	1	San Juan Harbor, P. R	5			Rare.
2930	J.A.C.	6	8	do	2			Few.

ROTALIA (?) PERLUCIDA Heron-Allen and Earland

Plate 13, figures 4*a–c*

This form does not seem to be a *Rotalia* in the restricted sense. It was described from the Clare Island region[25] and recorded from the west of Scotland[26] and from South Cornwall[27] by the same authors. A copy of the original figures is given here. Like most of the species of the Clare Island Report, Heron-Allen and Earland record it from the Kerimba Archipelago off southeastern Africa, from the Antarctic and from Lord Howe Island in the Pacific, but without figures.

ROTALIA (?) CALCAR d'Orbigny (?)

This species figured in the Cuban report has always been very questionable, and it is probable that in sorting material this typical Indo-Pacific species became mixed in some way and erroneously recorded from the West Indies. If it occurs in the region, it seems that it should have occurred in some of the many lots of material that have been examined from this area. The figures however are not typical.

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[25] Proc. Roy. Irish Acad., vol. 31, pt. 64, 1913, p. 139, pl. 13, figs. 7–9.

[26] Trans. Linn. Soc. London, ser. 2, vol. 11, 1916, p. 277.

[27] Journ. Roy. Micr. Soc., 1916, p. 53.

ROTALIA PULCHELLA d'Orbigny (?)

In the Cuban report, this species is also figured as coming from Cuba. It is known only from the Indo-Pacific, and like the preceding probably was included by some error as coming from this locality.

ROTALIA SCHROETERIANA Parker and Jones (?)

Under this name, Heron-Allen and Earland[28] record a specimen from a station west of Scotland. It is much simpler than the usual form of this species as developed in the Indo-Pacific, and seems to be far from its normal habitat. More specimens would be necessary to confirm this as identical with the large tropical species of this name.

Subfamily 5. SIPHONININAE

Test trochoid, at least in the early stages, umbilical area filled, supplementary apertures near the periphery and just below it on the ventral side, sometimes with a neck and lip.

Genus EPISTOMINA Terquem, 1883

Epistomina TERQUEM, Bull. Soc. Géol. France, sér. 3, vol. 11, 1883, p. 37.—CUSHMAN, Contr. Cushman Lab. Foram. Res., vol. 3, 1927, p. 181; Special Publ. No. 1, Cushman Lab. Foram. Res., 1928, p. 276.
Rotalia (*Turbinulina*) (part) D'ORBIGNY, 1826.
Pulvinulina (part) of AUTHORS.
Placentula BERTHELIN, 1882 (not Lamarck).

Genotype, by designation.—*Epistomina regularis* Terquem.

Test free, biconvex, trochoid, all whorls visible from the dorsal side, only the last-formed one from the ventral side; chambers numerous, usually distinct, not inflated; sutures distinct, of very solid material, limbate, on the dorsal side oblique, on the ventral side obliquely radiate, strongly limbate in nearly all species, sometimes strongly raised into a highly ornate surface, umbilicus usually filled and umbonate; wall finely perforate, usually thin between the sutures, especially on the dorsal side, often with irregular thickened areas appearing light colored against the darker translucent portion; apertures of two sorts, one in the normal position for the Rotaliidae, at the inner margin of the ventral side of the chamber or in the face itself, the other elongate, just below the periphery and in the axis of coiling, in later chambers usually filled with clear shell material.

The genus is well developed from the Jurassic onward. The Jurassic and Early Cretaceous species are highly ornate while most of the Late Tertiary and the Recent species are smooth. The living forms can be grouped under a single species.

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[28] Trans. Linn. Soc. London, ser. 2, vol. 11, 1916, p. 278, pl. 43, figs. 1–3.

EPISTOMINA ELEGANS (d'Orbigny)

Plate 13, figures 6 *a–c*

"Nautili *Ammoniformes* sive *trochiformes*," SOLDANI, Test., vol. 2, App., 1798, pl. 2, fig. R.

Rotalia (*Turbinulina*) *elegans* D'ORBIGNY, Ann. Sci. Nat., vol. 7, 1826, p. 276, No. 54 (not *Rotalia elegans*, Ann. Sci. Nat., vol. 7, 1826, p. 272, No. 6=nomen nudum).

Rotalina partschiana D'ORBIGNY, Foram. Foss. Bass. Tert. Vienne, 1846, p. 153, pl. 7, figs. 28–30; pl. 8, figs. 1–3.

Pulvinulina repanda, var. *elegans* PARKER and JONES, Philos. Trans., vol. 155, 1865, p. 397, pl. 16, figs. 44–46.

Pulvinulina partschiana REUSS, Sitz. Akad. Wiss. Wien, vol. 55, 1867, p. 104.—KARRER, Sitz. Akad. Wiss. Wien, vol. 58, 1868, p. 186.—H. B. BRADY, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 699, pl. 105, figs. 3 *a–c*, text fig. 21.—EGGER, Abhandl. Kön. bay. Akad. Wiss. München, Cl. II, vol. 18, 1893, p. 410, pl. 17, fig. 43; pl. 18, figs. 25–27.—CHAPMAN, Proc. Zool. Soc. London, 1895, p. 42.—FLINT, Ann. Rep't. U. S. Nat. Mus., 1897 (1899), p. 331, pl. 75, fig. 3.—BAGG, Proc. U. S. Nat. Mus., vol. 34, 1908, p. 162.—CHAPMAN, Proc. Roy. Soc. Victoria, vol. 22, 1910, p. 287.—TOULA, Jahrb. Kais.-kön. Geol. Reichs., vol. 64, 1914 (1915), p. 666.—CUSHMAN, Bull. 71, U. S. Nat. Mus., pt. 5, 1915, p. 64.—SIDEBOTTOM, Journ. Roy. Micr. Soc., 1918, p. 260.—CUSHMAN, Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 344.—HERON-ALLEN and EARLAND, British Antarctic Exped., Zool., vol. 6, 1922, p. 218.—MARTINOTTI, Atti Soc. Ital. Sci. Nat., vol. 62, 1923, p. 352.—HANZAWA, Jap. Journ. Geol. Pal., vol. 4, 1925 (1926), p. 44.—KOCH, Ber. Schweiz. Pal. Ges., vol. 19, 1926, p. 748.—PLUMMER, Bull. 2644, Univ. Texas, 1927, p. 153, pl. 11, figs. 5 *a–c*.

Pulvinulina elegans PARKER, JONES, and H. B. BRADY, Ann. Mag. Nat. Hist., ser. 4, vol. 8, 1871, p. 174, pl. 12, fig. 142.—H. B. BRADY, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 699, pl. 105, figs. 4–6.—H. B. BRADY, PARKER, and JONES, Trans. Zool. Soc., vol. 12, 1888, p. 228, pl. 46, fig. 2.—J. WRIGHT, Proc. Roy. Irish Acad., ser. 3, vol. 1, 1891, p. 492.—SILVESTRI, Mem. Accad. Pont. Nuovi Lincei, vol. 9, 1893, p. 214.—AMICIS, Boll. Soc. Geol. Ital., vol. 12, 1893, p. 163.—EGGER, Abhandl. Kön. bay. Akad. München, Cl. II, vol. 18, 1893, p. 410, pl. 18, figs. 37–39.—GOËS, Kongl. Svensk. Vet. Akad. Handl., vol. 25, No. 9, 1894, p. 97, pl. 16, fig. 808.—AMICIS, Nat. Sicil., Ann. XIV, 1895, p. 119.—CHAPMAN, Proc. Zool. Soc. London, 1895, p. 42.—SILVESTRI, Atti Accad. Sci. Acireale, vol. 7, 1896, p. 88.—GOËS, Bull. Mus. Comp. Zoöl., vol. 29, 1896, p. 76.—FLINT, Rep't U. S. Nat. Mus., 1897 (1899), p. 331, pl. 75, fig. 1.—JONES, Foram. Crag, pt. 4, 1897, p. 324, pl. 7, figs. 32*a*, *b*.—KIAER, Rep't. Norwegian Fish. & Mar. Invest., vol. 1, No. 7, 1900, p. 47.—FORNASINI, Mem. Accad. Sci. Istit. Bologna, ser. 5, vol. 10, 1902, p. 58.—MILLETT, Journ. Roy. Micr. Soc., 1904, p. 501.—CHAPMAN, Journ. Quekett Micr. Club, ser. 2, vol. 10, 1907, p. 139.—BAGG, Proc. U. S. Nat. Mus., vol. 34, 1908, p. 161.—CHAPMAN, Subantarctic Islands of New Zealand, 1909, p. 362; Proc. Roy. Soc. Victoria, vol. 22, 1910, p. 288; Journ. Linn. Soc. Zool., vol. 30, 1910, p. 421.—SCHUBERT, Abhandl. geol. Reichs., vol. 20, pt. 4, 1911, p. 112, pl. 3, fig. 3.—BAGG, U. S. Geol. Surv. Bull. 513, 1912, p. 86, pl. 26, figs. 11–15.—HERON-ALLEN and EARLAND, Proc. Roy. Irish Acad., vol. 31, pt. 64, 1913, p. 138.—TOULA, Jahrb. Kais.-kön. Geol. Reichs., vol. 64, 1914 (1915), p. 645.—PEARCEY, Trans. Roy. Soc. Edinburgh, vol. 49, 1914, p. 1029.—CUSHMAN, Bull. 71, U. S. Nat. Mus., pt. 5, 1915, p. 63, pl. 26, fig. 3.—

Chapman, Biol. Res. *Endeavour*, vol. 3, pt. 1, 1915, p. 32.—Heron-Allen and Earland, Trans. Zool. Soc., vol. 20, 1915, p. 717; Trans. Linn. Soc. London, vol. 11, 1916, p. 277; Journ. Roy. Micr. Soc., 1916, p. 52.—Sidebottom, Journ. Roy. Micr. Soc., 1918, p. 260.—Cushman, Proc. U. S. Nat. Mus., vol. 56, 1919, p. 631; Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 342.—Heron-Allen and Earland, British Antarctic Exped., Zoology, vol. 6, 1922, p. 218; Journ. Roy. Micr. Soc., 1924, p. 180; Journ. Linn. Soc. Zool., vol. 35, 1924, p. 637.—Cushman, Bernice P. Bishop Museum, Bull. 27, 1925, p. 134.—Hanzawa, Jap. Journ. Geol. Pal., vol. 4, 1925 (1926), p. 44.—Nuttall, Quart. Journ. Geol. Soc., vol. 84, 1928, p. 101, pl. 7, figs. 9, 10.—Casasnovas, Not. Y Res. Instit. Esp. Ocean., ser. 2, No. 29, 1928, p. 8.

Pulvinulina elegans, var. *partschiana* Chapman, Rep't. British Antarctic Exped., Geology, vol. 2, 1916 (1917), p. 70, pl. 5, fig. 40.

Epistomina elegans Martinotti, Boll. R. Ufficio geol. Ital., vol. 51, 1926, p. 3.—Cushman, Journ. Pal., vol. 1, 1927, p. 166, pl. 26, figs. 3, 4; Contr. Cushman Lab. Foram. Res., vol. 3, 1927, p. 182, pl. 31, figs. 1–6; pl. 32, figs. 1–8.

Epistomina partschiana Clodius, Archiv. Ver. Freunde Mecklenburg, 75 Jahr., 1922, p. 142.—Cushman, Bull. Scripps Inst. Ocean., Tech. Ser., vol. 1, No. 10, 1927, p. 163, pl. 5, figs. 4, 5.

Epistomina bradyi Galloway and Wissler, Journ. Pal., vol. 1, 1927, p. 60, pl. 10, fig. 1.

Epistomina flinti Galloway and Wissler, Journ. Pal., vol. 1, 1927, p. 61, pl. 9, fig. 16.

Test biconvex, either with the sides nearly equally convex or the ventral side more stongly so especially in the microspheric form, periphery rounded or in small specimens more acute; chambers usually distinct, typically 7 to 9 in the megalospheric form, increasing to as many as 14 in the largest microspheric specimens; sutures distinct, limbate, but not raised, on the dorsal side strongly oblique, on the ventral side obliquely radial ending at the center in an umbonate mass; wall finely perforate, in the thin walled specimens often showing a complex pattern of thickenings, in thick walled specimens opaque; aperture usually narrow on the ventral side at the base of the last-formed chamber toward the periphery with a supplementary aperture in the axis of coiling, parallel to the peripheral margin and just ventral to it, elongate. Diameter up to 2 mm. in microspheric specimens.

This is one of the few species of the Rotaliidae that is a characteristic one of *Globigerina*-ooze. It is widely distributed in the *Albatross* dredgings as the table shows. This very wide distribution suggests that it may possibly be pelagic in its early stages. Our figured specimen shows the early stage with thin walls and peculiar pattern due to thickenings of the wall. The microspheric forms become very thick walled and grow to considerable size. The wall is in layers which easily break away, and as a result many of the specimens are imperfect. The thin lip along the peripheral margin also forms a line of weakness and is easily broken away.

Epistomina elegans—Material examined

Catalogue No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
			Albatross	° ′ ″ ° ′ ″				
21730	U.S.N.M.	7	D2034	39 27 10 N.; 69 56 20 W.	1,346	38	glob. oz	Common.
21731	U.S.N.M.	10+	D2037	38 53 00 N.; 69 23 30 W.	1,731	38	glob. oz	Abundant.
21732	U.S.N.M.	10+	D2038	38 30 30 N.; 69 08 25 W.	2,033		glob. oz	Do.
21733	U.S.N.M.	10+	D2039	38 19 26 N.; 68 20 20 W.	2,369		glob. oz	Do.
21734	U.S.N.M.	10+	D2041	39 22 50 N.; 68 25 00 W.	1,608	38	glob. oz	Do.
21735	U.S.N.M.	10+	D2042	39 33 00 N.; 68 26 45 W.	1,555	38.5	glob. oz	Do.
21736	U.S.N.M.	2	D2052	39 40 05 N.; 69 21 25 W.	1,098	45	glob. oz	Rare.
21737	U.S.N.M.	10+	D2097	37 56 20 N.; 70 57 30 W.	1,917		glob. oz	Abundant.
21738	U.S.N.M.	10+	D2105	37 50 00 N.; 73 03 50 W.	1,395	41	glob. oz	Do.
21739	U.S.N.M.	10+	D2106	37 41 20 N.; 73 03 20 W.	1,497	42.5	glob. oz	Do.
21740	U.S.N.M.	3	D2117	39 47 20 N.; 69 34 15 W.	924	38.1	gy. m	Rare.
21741	U.S.N.M.	10+	D2138	17 44 05 N.; 75 39 00 W.	23		hrd. co	Abundant.
21742	U.S.N.M.	7	D2150	13 34 45 N.; 81 21 10 W.	382	45.8	wh. crs. s	Common.
21743	U.S.N.M.	9	D2208	39 33 00 N.; 71 16 15 W.	1,178	38.4	gn. m	Do.
21744	U.S.N.M.	1	D2217	39 47 20 N.; 69 34 15 W.	924	38.1	gy. m	Rare.
21745	U.S.N.M.	7	D2226	37 00 00 N.; 71 54 00 W.	2,045	36.8	glob. oz	Common.
21746	U.S.N.M.	1	D2262	39 54 45 N.; 69 29 45 W.	250	41.6	gn. m., s	Rare.
21747	U.S.N.M.	3	D2335	23 10 39 N.; 82 20 21 W.	204			Do.
21748	U.S.N.M.	1	D2352	22 35 00 N.; 84 23 00 W.	463	45	wh. co	Do.
21749	U.S.N.M.	2						
21750	U.S.N.M.	3	D2381	28 05 00 N.; 87 56 15 W.	1,330		lt. br. m	Do.
21751	U.S.N.M.	5	D2392	28 47 30 N.; 87 27 00 W.	724	40.7	br. gy. m	Few.
21753	U.S.N.M.	1	D2398	28 45 00 N.; 86 26 00 W.	227	48.6	gy. m	Rare.
21754	U.S.N.M.	1	D2400	28 41 00 N.; 86 07 00 W.	169		gy. m	Do.
21755	U.S.N.M.	8	D2416	31 26 00 N.; 79 07 00 W.	276	53.8	co., brk. sh	Common.
21756	U.S.N.M.	1	D2550	39 44 30 N.; 70 30 45 W.	1,081	38.5	br. m	Rare.
21757	U.S.N.M.	4	D2552	39 47 07 N.; 70 35 00 W.	721	39.6	gy. oz	Few.
21758	U.S.N.M.	10+	D2562	39 15 30 N.; 71 25 00 W.	1,434	37.3	gy. oz	Abundant.
21759	U.S.N.M.	10+	D2563	39 18 30 N.; 71 23 30 W.	1,422	37.4	gy. oz	Do.
21761	U.S.N.M.	1	D2570	39 54 00 N.; 67 05 30 W.	1,813	36.8	glob. oz	Rare.
21762	U.S.N.M.	7	D2573	40 34 18 N.; 66 09 00 W.	1,742	37.3	gy. m., s	Common.
21763	U.S.N.M.	3	D2585	39 08 30 N.; 72 17 00 W.	542	39	dk. gy. m	Rare.
21764	U.S.N.M.	4	D2586	39 02 40 N.; 72 40 00 W.	328	40.2	dk. gy. m	Few.
21765	U.S.N.M.	3	D2641	25 11 30 N.; 80 10 00 W.	60	69.2	co. s	Rare.
21766	U.S.N.M.	1	D2668	30 58 30 N.; 79 38 30 W.	294	46.3	gy. s., dd. co.	Do.
21767	U.S.N.M.	1	D2679	32 40 00 N.; 76 40 30 W.	782	38.6	lt. gy. oz	Do.
21768	U.S.N.M.	5	D2706	41 28 30 N.; 65 35 30 W.	1,188		gy. oz., for	Few.
21769	U.S.N.M.	1	D2713	38 20 00 N.; 70 08 30 W.	1,859		br. oz	Rare.
21770	U.S.N.M.	10+	D2714	38 22 00 N.; 70 17 30 W.	1,825		br. oz	Abundant.
21771	U.S.N.M.	5	D2716	38 29 30 N.; 70 57 00 W.	1,631		br. oz., for	Few.
21772	U.S.N.M.	4	D2751	16 54 00 N.; 63 12 00 W.	687	40	bu. glob. oz.	Do.
21773	U.S.N.M.	1	D2760	12 07 00 S.; 37 17 00 W.	1,019	39.5	br. co	Rare.
21774	U.S.N.M.	4	D2761	15 39 00 S.; 38 32 54 W.	818	39	pter. oz	Few.
21775	U.S.N.M.	3	D2763	24 17 00 S.; 42 48 30 W.	671	37.9	bu. glob. oz.	Do.
21776	U.S.N.M.	1		Off Sambo Key, Fla	50			Rare.
12991	J.A.C.	2		Off Ragged Reef, Fla	85			Do.
21777	U.S.N.M.	1		Off Sand Key, Fla	85			Do.
21778	U.S.N.M.	1	*Goldseeker*	Off S. W. Ireland	620–695			Do.

Genus EPISTOMELLA Cushman, 1928

Epistomella Cushman, Contr. Cushman Lab. Foram. Res., vol. 4, 1928, p. 6; Special Publ. No. 1, Cushman Lab. Foram. Res., 1928, p. 276.

Discorbina (part) Parker and Jones, Philos. Trans., vol. 155, 1865, pp. 385, 421.

Genoholotype.—Discorbina rimosa Parker and Jones.

Test trochoid, the dorsal side with regular chambers, the ventral side with supplementary chambers or alar projections toward the umbilicus which is covered; wall calcareous, finely perforate; apertures on the ventral side at the periphery of the secondary chambers and supplementary apertures on the dorsal side at the inner edge of the chamber along the suture between it and the preceding chamber, narrow and elongate.

Eocene to Recent.

There are no Atlantic records for the genus, the living forms being restricted to the Indo-Pacific.

Genus SIPHONINA Reuss, 1849

Siphonina Reuss, Denkschr. k. Akad. Wiss. Wien, vol. 1, 1850, p. 372.—Cushman, Special Publ. No. 1, Cushman Lab. Foram. Res., 1928, p. 278.
Rotalia (part) Czjzek (not Lamarck).
Planorbulina (part) Parker and Jones, 1865 (not d'Orbigny).
Truncatulina (part) of Authors.

Genoholotype.—Siphonina fimbriata Reuss.

Test trochoid, biconvex, umbilical region typically closed; wall calcareous, coarsely perforate; aperture just ventral to the periphery, elliptical, with the long axis parallel to the periphery, in fully developed species with a short neck and phialine lip.

Cretaceous to Recent.

For a fuller discussion of this genus and its species, see Cushman, Foraminifera of the Genus *Siphonina* and Related Genera.[29]

SIPHONINA RETICULATA (Czjzek) (?)

Plate 14, figures 1 *a–c*

Rotalina reticulata Czjzek, Haidinger's Nat. Abhandl., vol. 2, 1848, p. 145 pl. 13, figs. 7–8.
Siphonina reticulata Brown, Lethaea Geognostica, ed. 3, vol. 3, 1853–1856, p. 227, pl. 35, figs. 23 *a–c*.—Cushman, Proc. U. S. Nat. Mus., vol. 72, art. 20, 1927, p. 7, pl. 1, figs. 1, 2; pl. 3, fig. 4.
Siphonina fimbriata Reuss, Denkschr. Akad. Wiss. Wien, 1849, p. 372, pl. 47, fig. 6.

Test nearly equally biconvex, somewhat compressed, periphery angled; usually four chambers in the last-formed volution, only slightly inflated; sutures depressed slightly on the ventral side, radial, on the dorsal side curved, strongly marked by the fimbriation of the periphery of the chambers; aperture elliptical, with a distinct lip and well marked, contracted neck.

Diameter, 0.50 mm.; thickness, 0.25–0.30 mm.

The various references to this species cover several different species, and when no figures are given, it is very difficult to make sure of the correct identification. From the Atlantic coast of Europe there are several references to this species as follows: off Island of Jersey;[30] off Southport, England; off Kinsale, County Cork, Ireland and off Portugal;[31] very rare, poor and worn, Bognor, Sussex, England;[32] two typical examples, So. Cornwall, England;[33] off West Africa.[34]

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[29] Proc. U. S. Nat. Mus., vol. 72, Art. 20, 1927, pp. 1–15, pls. 1–4.

[30] Halkyard, Trans. Manchester Micr. Soc., 1889, p. 70.

[31] Chaster, First Rep't. Southport Soc. Nat. Sci., 1890–91 (1892), p. 66, pl. 1, fig. 16.

[32] Earland, Journ. Quekett Micr. Club, ser. 2, vol. 9, 1905, p. 226.

[33] Heron-Allen and Earland, Journ. Roy. Micr. Soc., 1916, p. 51.

[34] Egger, Abhandl. kön. bay. Akad. Wiss. München, Cl.II, vol. 18, 1893, p. 402, pl. 16, figs. 42–44.

The figured specimen is from the coast of Belgium. This does not entirely fit with the specimens from the Miocene of the Vienna Basin, but may be left under this species for the present.

SIPHONINA PULCHRA Cushman

Plate 14, figures 2, 3

Siphonina pulchra Cushman, Carnegie Inst., Washington, Publ. 291, 1919, p. 42, pl. 14, figs. 7 *a–c*; Publ. 311, 1922, p. 49, pl. 7, figs. 11, 12; Publ. 344, 1926, p. 42; Proc. U. S. Nat. Mus., vol. 72, Art. 20, 1927, p. 8, pl. 2, fig. 5.

Siphonina reticulata Cushman (not Czjzek), Carnegie Inst., Washington, Publ. 291, 1919, p. 42.

Test nearly circular, about equally biconvex, periphery subacute or even somewhat rounded, compressed; chambers usually five in the last-formed volution, not inflated; sutures distinct, not depressed, limbate; wall smooth, conspicuously perforate; aperture elliptical, with a distinct lip and short well-marked neck.

Diameter up to 0.65 mm.; thickness, 0.30 mm.

This species was originally described from the Miocene of the gorge of the Yumuri River, Matanzas, Cuba. It is still living in the general West Indian region. The young stages are carinate as shown in Plate 14, figure 3, and resemble in general *S. reticulata* but in the adult the peripheral carina is largely lost and the sutures become more limbate as in Plate 14, figure 2.

The species ranges as far south as the coast of Brazil, and is widely distributed off the coast of Florida and in the general West Indian region in fairly shallow water.

Siphonina pulchra—Material examined

Catalogue No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
			Albatross	° ′ ″ ° ′ ″				
21799	U.S.N.M.	1	D2641	25 11 30 N.; 80 10 00 W.	60	69.2	co. s.	Rare.
21780	U.S.N.M.	1	D2629	23 48 40 N.; 75 10 40 W.	1169	38.4	co. s.	Do.
2983	J. A. C.	1	9	Dry Tortugas, Fla	1	------	m.	Do.
2986	J. A. C.	1	13	do	11	------	fne. s.	Do.
2979	J. A. C.	1	14	do	12	------	fne. s.	Do.
2978	J. A. C.	1	19	do	5.75	------	fne. wh. s.	Do.
2982	J. A. C.	3	21	do	6	------	fne. wh. s.	Do.
2981	J. A. C.	2	22	do	6	------	fne. wh. s.	Do.
2980	J. A. C.	4	23	do	10.5	------	m. s.	Few.
10187	J. A. C.	2						
2984	J. A. C.	1	27	do	7	------	m.	Rare.
2987	J. A. C.	2	28	do	4.75	------	fne. wh. s.	Do.
2985	J. A. C.	3	37	do	11	------	fne. s.	Do.
2989	J. A. C.	5	4	San Juan Harbor, P. R.	1	------	------	Few.
2988	J. A. C.	1	6	do	1.5	------	------	Rare.
12992	J. A. C.	1	------	Montego Bay, Jamaica	------	------	------	Do.
12932	J. A. C.	2	------	Bermuda	------	------	------	Do.

SIPHONINA BRADYANA Cushman

Plate 14, figures 4 *a–c*

Truncatulina reticulata H. B. Brady (part) (not Czjzek), Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, pl. 96, fig. 8.—H. B. Brady, Parker, and Jones, Trans. Zool. Soc. London, vol. 12, 1888, p. 228, pl. 45, figs. 23 *a–c* (not 24 *a*, *b*?).—Flint, Ann. Rep't. U. S. Nat. Mus., 1897 (1899), p. 334, pl. 78, fig. 3.

Siphonina bradyana Cushman, Proc. U. S. Nat. Mus., vol. 72, Art. 20, 1927, p. 11, pl. 1, figs. 4 *a–c*.

Siphonina bradyana—Material examined

Catalogue No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
			Albatross	° ′ ″ ° ′ ″				
21781	U.S.N.M.	2	D2150	13 34 45 N.; 81 21 10 W.	382	45.8	wh. crs. s.	Rare.
21782	U.S.N.M.	1						
21783	U.S.N.M.	1	D2352	22 35 00 N.; 84 23 00 W.	463	45	wh. co.	Do.
21784	U.S.N.M.	10+	D2355	20 56 48 N.; 86 27 00 W.	399		yl. oz.	Abundant.
21785	U.S.N.M.	1		Off Fowey, Fla.	47			Rare.

Test nearly equally biconvex, periphery acute with a broad thin carina somewhat fimbriate, but the fine tubules not reaching to the edge of the keel, the outer half of which is clear; chambers about five in the last-formed volution, not inflated; sutures distinct, limbate, not depressed; wall coarsely perforate, smooth; aperture elliptical, with a broad flaring lip but very short neck.

Diameter, 0.60 mm.; thickness, 0.28 mm.

This species is so far as known limited to the West Indian region, and occurs in deeper water than the preceding. The wide keel and the very smooth surface are characteristic of the species.

SIPHONINA TUBULOSA Cushman

Heron-Allen and Earland (Journ. Roy. Micr. Soc., 1930, p. 188, pl. 4, figs. 62–64) record this species from off the British Isles.

Genus SIPHONINOIDES Cushman, 1927

Siphoninoides Cushman, Contr. Cushman Lab. Foram. Res., vol. 3, 1927, p. 77; Special Publ. No. 1, Cushman Lab. Foram. Res., 1928, p. 278.

Planorbulina H. B. Brady, 1879 (not d'Orbigny).

Truncatulina of Authors (not d'Orbigny).

Siphonina (part) of Authors (not Reuss).

Genoholotype.—Planorbulina echinata H. B. Brady.

Test in the adult generally globular; chambers irregularly trochoid, becoming strongly involute in the adult; wall calcareous, perforate; aperture circular, with a very short neck and flaring lip.

Tertiary and Recent.

SIPHONINOIDES ECHINATA (H. B. Brady) (?)

Plate 14, figures 6 *a*, *b*

The figured specimen is from off the Tortugas, Fla., in comparatively shallow water. It is referred to Brady's species until more material may be available for a fuller understanding of its characters. *Siphoninoides* is a typically Indo-Pacific genus, and this is the only record from the Atlantic. Other typical Indo-Pacific species have occurred at the Tortugas, so the specimen probably is not an accidental one from some other material as might at first be suspected.

Genus SIPHONINELLA Cushman, 1927

Siphoninella Cushman, Contr. Cushman Lab. Foram. Res., vol 3, 1927, p. 77; Special Publ. No. 1, Cushman Lab. Foram. Res., 1928, p 279.

Truncatulina H. B. Brady, 1881 (not d'Orbigny).

Genoholotype.—Truncatulina soluta H. B. Brady.

Test in the early stages similar to *Siphonina*, in the later development with the chambers becoming uncoiled; wall calcareous, perforate, aperture in the adult terminal, elliptical, with a neck and lip.

Eocene to Recent.

There are now three species of this genus known: One from the Claiborne Eocene of Louisiana, one from the lower Oligocene, Byram marl of Mississippi, and the living species of Brady.

SIPHONINELLA SOLUTA (H. B. Brady)

Plate 14, figures 5 *a–c*

Truncatulina soluta H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 670, pl. 96, figs. 4 *a–c*.—Chapman, Journ. Linn. Soc. Zool., vol. 28, 1902, p. 406 (list).

Siphoninella soluta Cushman, Contr. Cushman Lab. Foram. Res., vol. 3, 1927, p. 77, pl. 16, fig. 13; Proc. U. S. Nat. Mus., vol. 72, art. 20, 1927, p. 12; Special Publ. No. 1, Cushman Lab. Foram. Res., 1928, pl. 40, fig. 10; pl. 41, fig. 13.

Test with all but the last 2 or 3 chambers trochoid, close-coiled, the last ones becoming uncoiled, periphery acute, with a distinct keel, tubulated; wall of the early chambers smooth, later with a few blunt spines with a row of spines along the sutures; aperture narrowly elliptical with a short constricted neck and distinct lip.

Length, 0.38 mm.; breadth, 0.25 mm.; thickness, 0.10 mm.

The types of this species are from *Challenger* Station 24 off Culebra Island in the West Indies, 390 fathoms. It is recorded by Brady as "very rare." Chapman has listed the species from about Funafuti in the Pacific. These seem to be the only records.

Subfamily 6. BAGGININAE

Test generally biconvex, the umbilical area closed, the area adjacent to it on each chamber with a thinner, rounded, clear area, usually without perforations; aperture at the base of the ventral margin of the chamber.

Genus CANCRIS Montfort, 1808

Cancris MONTFORT, Conch. Syst., vol. 1, 1808, p. 267.—CUSHMAN, Special Publ. No. 1, Cushman Lab. Foram. Res., 1928, p. 279.

Nautilus (part) FICHTEL and MOLL, 1798 (not Linnaeus).

Rotalina (part) WILLIAMSON, 1858 (not d'Orbigny).

Pulvinulina (part) of AUTHORS.

Genoholotype.—Nautilus auriculus Fichtel and Moll.

Test trochoid, nearly equally biconvex, compressed; chambers few, rapidly enlarging as added; wall calcareous, perforate; umbilical area with a clear plate of rather large dimensions for the size of the test; aperture narrow, on the inner border of the ventral side of the last-formed chamber.

Tertiary and Recent.

Species of this genus occur abundantly on both sides of the Atlantic, and are distinctive.

CANCRIS AURICULA (Fichtel and Moll)

Plate 15, figures 1 *a–c*

Nautilus auricula, var. *a*, FICHTEL and MOLL, Test. Micr., 1803, p. 108, pl. 20, figs. *a–c*; var. *β*, pl. 20, figs. *d–f*.

Pulvinulina auricula PARKER and JONES, Philos. Trans., vol. 155, 1865, p. 393.—H. B. BRADY, Trans. Linn. Soc. Zool., vol. 24, 1864, p. 474.—JONES, PARKER, and H. B. BRADY, Foram. Crag, 1866, pl. 2, figs. 33–35.—PARKER, JONES, and H. B. BRADY, Ann. Mag. Nat. Hist., ser. 4, vol. 8, 1871, p. 173, pl. 12, fig. 143.—BROECK, Bull. Soc. Etude Sci. Nat. Nimes, 6 Anne, 1878, p. 20.—TERRIGI, Atti Accad. Pont. Nuovi Lincei, vol. 33, 1880, p. 206, pl. 3, fig. 58.—GOËS, Kongl. Svensk. Vet. Akad. Handl., vol. 19, No. 4, 1882, p. 109, pl. 8, figs. 273–275.—TERRIGI, Atti Accad. Pont. Nuovi, vol. 35, 1883, p. 199.—H. B. BRADY, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 688, pl. 106, figs. 5*a–c*.—BALKWILL and WRIGHT, Trans. Roy. Irish Acad., vol. 28, Sci., 1885, p. 351.—SIDDALL, Proc. Lit. Phil. Soc. Liverpool, 1886, p. 71.—MALAGOLI, Atti Soc. Nat. Modena (Rend), ser. 3, vol. 3, 1887, p. 110, pl. 1, fig. 16.—HALKYARD, Trans. Manchester Micr. Soc., 1889, p. 70.—HOWCHIN, Trans. Proc. Roy. Soc. So. Australia, vol. 12, 1889, p. 14.—TERRIGI, Mem. R. Accad. Lincei, ser. 4, vol. 6, 1889, p. 119, pl. 9, fig. 2.—WRIGHT, Proc. Roy. Irish Acad., ser. 3, vol. 1, 1891, p. 491.—CHASTER, First Rep't. Southport Soc. Nat. Sci., 1890–91 (1892), p. 66.—EGGER, Abhandl. kön. bay. Akad. Wiss. München, Cl. II, vol. 18, 1893, p. 415, pl. 17, figs. 26–28.—WOODWARD, The Observer, vol. 4, 1893, p. 177.—GOËS, Kongl. Svensk. Vet. Akad. Handl., vol. 25, No. 9, 1894, p. 98, pl. 16, figs. 809, 810.—AMICIS, Nat. Sicil., Ann. 14, 1895, p. 119.—CHAPMAN, Proc. Zool. Soc. London, 1895, p. 43.—JONES, Foram. Crag, pt. 4, 1897, p. 320, pl. 2, figs. 33–35.—

Flint, Ann. Rep't. U. S. Nat. Mus., 1897 (1899), p. 329, pl. 73, fig. 2.—Wright, Irish Nat., vol. 9, 1900, p. 55.—Kiaer, Rep't. Norwegian Fish. Mar. Invest., vol. 1, No. 7, 1900, p. 47.—Liebus, Neues Jahrb. für Min., 1901, p. 126.—Chapman, Journ. Linn. Soc. Zool., vol. 28, 1902, p. 407.—Earland, Journ. Quekett Micr. Club, ser. 2, vol. 9, 1905, p. 227.—Chapman, Trans. New Zealand Instit., vol. 38, 1905 (1906), p. 105.—Millett, Rec. Foram. Galway, 1908, p. 6.—Wright, Proc. Belfast Nat. Field Club, Appendix, 1910–11 (1911), p. 7.—Heron-Allen and Earland, Journ. Roy. Micr. Soc., 1911, p. 337; Proc. Roy. Irish Acad., vol. 31, pt. 64, 1913, p. 136.—Chapman, Biol. Res. *Endeavour*, vol. 3, pt. 1, 1915, p. 31.—Heron-Allen and Earland, Trans. Zool. Soc. London, vol. 20, 1915, p. 714.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 5, 1915, p. 53, pl. 22, fig. 1.—Heron-Allen and Earland, Trans. Linn. Soc. London, ser. 2, vol. 11, 1916, p. 276; Journ. Roy. Micr. Soc., 1916, p. 51.—Sidebottom, Journ. Roy. Micr. Soc., 1918, p. 260.—Cushman, Proc. U. S. Nat. Mus., vol. 56, 1919, p. 631.—Halkyard, Mem. Proc. Manchester Lit. Philos. Soc., vol. 62, pt. 2, 1918 (1919), p. 124.—Cushman, Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 329, pl. 69, figs. 3*a–c*.—Clodius, Archiv. Ver. Freunde Nat. Mecklenburg, 75 Jahr., 1922, p. 139.—Heron-Allen and Earland, Bull. Soc. Sci. Hist. Nat. Corse, 1922, p. 138; British Antarctic Exped., Zoology, 1922, p. 214.—Hanzawa, Jap. Journ. Geol. Pal., vol. 4, 1925 (1926), p. 43.—Chapman, New Zealand Geol. Surv., Pal. Bull. No. 11, 1926, p. 81, pl. 16, fig. 8.

Pulvinulina repanda, var. *auricula* Parker and Jones, Introd. Foram., 1862, Appendix p. 311.

Valvulina oblonga d'Orbigny, in Barker-Webb and Berthelot, Hist. Nat. Iles Canaries, 1839, vol. 2, pt. 2, "Foraminifères", p. 136, pl. 1, figs. 40–42.

Pulvinulina oblonga Williamson, Rec. Foram. Gt. Britain, 1858, p. 51, pl. 4, figs. 98–100.—H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 688, pl. 106, figs. 4 *a–c*.—Mariani, Atti Soc. Ital. Sci. Nat., vol. 31, 1888, p. 125.—Howchin, Trans. Proc. Roy. Soc. So. Australia, vol. 12, 1889, p. 14.—Egger, Abhandl. kön. bay. Akad. Wiss. München, Cl. II, vol. 18, 1893, p. 415, pl. 17, figs. 23–25.—Amicis, Boll. Soc. Geol. Ital., vol. 12, fasc. 3, 1893, p. 161.—Grzybowski, Rozprawy Spraw. mat.-przyr. uhad. Krakow., vol. 9, 1894, p. 203, pl. 5, fig. 8.—Chapman, Proc. Zool. Soc. London, 1895, p. 43.—Liebus, Neues Jahrb. für Min., 1901, p. 126.—Chapman, Journ. Linn. Soc. Zool., vol. 28, 1902, pp. 196, 209.—Millett, Journ. Roy. Micr. Soc., 1904, p. 497.—Dakin, Rep't. Pearl Oyster Fish. Ceylon, 1906, p. 239.—Heron-Allen and Earland, Journ. Roy. Micr. Soc., 1909, p. 684.—Sidebottom, Mem. Proc. Manchester Lit. Philos. Soc., vol. 53, No. 21, 1909, p. 6; vol. 54, No. 16, 1910, p. 27.—Heron-Allen and Earland, Proc. Roy. Irish Acad., vol. 31, pt. 64, 1913, p. 136; Trans. Zool. Soc. London, vol. 20, 1915, p. 714; Trans. Linn. Soc. London, ser. 2, vol. 11, 1916, p. 276; Journ. Roy. Micr. Soc., 1916, p. 51.—Chapman, Rep't. British Antarctic Exped., Geology, vol. 2, 1916 (1917), p. 46, pl. 5, fig. 11.—Sidebottom, Journ. Roy. Micr. Soc., 1918, p. 260.—Cushman, Proc. U. S. Nat. Mus., vol. 56, 1919, p. 630.—Martinotti, Atti Soc. Ital. Sci. Nat., vol. 59, 1920, p. 334.—Cushman, Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 330.—Heron-Allen and Earland, Bull. Soc. Sci. Hist. Nat. Corse, 1922, p. 138; British Antarctic Exped., Zoology, vol. 6, 1922, p. 214.—Casasnovas, Not. Y Res. Instit. Esp. Ocean., ser. 2, No. 29, 1928, p. 8.

Rotalia brongniarti d'Orbigny, Ann. Sci. Nat., vol. 7, 1826, p. 273.—Fornasini, Mem. Accad. Sci. Bologna, ser. 5ª, vol. 7, 1888 (1889), p. 248, fig. 1 (in text).

The figures comprised in the references above given show a considerable range in their characters, and it may be very probable that they represent more than one species. In the two sets of figures given by Fichtel and Moll, there seems to be very little in the way of real differences. Williamson's form shows little that is different. The species is much larger than the shallow water one of the West Indian region next considered. In the waters off western Europe the large form which may be referred to Fichtel and Moll's species is often very common. The records seem to indicate that it occurs southward to the Canaries, and a few specimens referable to it occur in the deeper water of the western Atlantic. It is evidently a widely distributed species, but careful study of large series from various parts of the world may show more than one species. It occurs in the Tertiary of Europe and perhaps elsewhere.

Cancris auricula—Material examined

Cat. No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
3062	J.A.C.	1	------------	Dogs Bay, Ireland	------	------	------------	Rare.
21786	U. S. N. M.	1	------------	do	------	------	------------	Do.
12993	J.A.C.	9	*Flying Falcon* Log. 8	10 mi. S. of Glencoe, Ireland.	------	------	------------	Common.
12994	J.A.C.	5	*Lord Bandon* Log. 42	Off Bantry Bay, SW. Ireland.	------	------	------------	Few.
12995	J.A.C.	10+	Log. 33	Nymph Bank, S. of Cork Harbor, Ireland.	------	------	------------	Abundant
12996	J.A.C.	2	*Goldseeker* Haul 23	Arnish Point, off the Minch.	------	------	------------	Rare.
21787	U. S. N. M.	1	------------	Off Fowey, Fla	65	------	------------	Do.
12997	J.A.C.	1	------------	Off Ragged Key, Fla	75	------	------------	Do.

CANCRIS SAGRA (d'Orbigny)

Plate 15, figures 2 *a–c*

Rotalina sagra d'Orbigny, in De la Sagra, Hist. Fis. Pol. Nat. Cuba, 1839, "Foraminifères," p. 77, pl. 5, figs. 13–15.

Pulvinulina sagra Cushman, Bull. 103, U. S. Nat. Mus., 1918, p. 70, pl. 24, figs. 6*a*, *b*; Bull. 676, U. S. Geol. Survey, 1918, p. 65, pl. 22, fig. 3; pl. 23, fig. 1; Prof. Paper 133, U. S. Geol. Survey, 1923, p. 45, pl. 6, figs. 9, 10 (?).

Pulvinulina semipunctata Cushman, Publ. 311, Carnegie Instit., Washington, 1922, p. 51, pl. 8, figs. 5, 6; Publ. 344, 1926, p. 78.

Pulvinulina oblonga H. B. Brady, Parker, and Jones, Trans. Zool. Soc. London, vol. 12, 1888, p. 229, pl. 46, fig. 5.—Pearcey, Trans. Roy. Soc. Edinburgh, vol. 49, 1914, p. 1041.

This much smaller, more compressed species from the shallow waters of the western tropical Atlantic seems to be distinct from that of the deeper water and of the cooler waters of the eastern Atlantic. The form I described from the Tortugas should probably belong with that described by d'Orbigny, and the apparent differences may be probably due to the lack of details in d'Orbigny's figure.

The species ranges from the coast of Brazil to the coast of Florida but in shallow water only. It occurs fossil in the Miocene, Choctawhatchee marl, of Florida.

Cancris sagra—Material examined

Catalogue No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
			Albatross	° ′ ″ ° ′ ″				
21788	U.S.N.M.	1	D2352	22 35 00 N.; 84 23 00 W	463	45	wh. co	Rare.
21789	U.S.N.M.	1						
21790	U.S.N.M.	2		Off Fowey, Fla	22			Do.
21791	U.S.N.M.	1		do	53			Do.
12998	J.A.C.	1		Off Long Reef	40			Do.
21792	U.S.N.M	1		Off Government Cut, Miami, Fla.	30			Do.
3091	J.A.C.	1	21	Dry Tortugas, Fla	6		fne. wh. s	Do.
3089	J.A.C.	1	22	do	6		fne. wh. s	Do.
3090	J.A.C.	1	28	do	4.75		fne. wh. s	Do.
3092	J.A.C.	1	42	do	18		s	Do.
3094	J.A.C.	8	4	Largo Shoal, San Juan Harbor, P. R.	1			Common.
3093	J.A.C.	1	9	Ponce, P. R	.5			Rare.

Genus BAGGINA Cushman, 1926

Baggina Cushman, Contr. Cushman Lab. Foram. Res., vol. 2, 1926, p. 63; Special Publ. No. 1, Cushman Lab. Foram. Res., 1928, p. 279.
Pulvinulina (part) of Authors.

Genoholotype.—Baggina californica Cushman.

Test subglobular, trochoid; chambers relatively few, dorsal side with the chambers in the adult more or less involute, the ventral side completely so; chambers large and inflated; wall calcareous, perforate, with a clear lunate space of small size on the chamber above the aperture; aperture broadly oval on the ventral side of the last-formed chamber, without a lip.

Miocene to Recent.

Typical living species seem to be confined to the Indo-Pacific although Earland has recorded "*Pulvinulina hauerii* d'Orbigny" from shore sands of Bognor, England. This is the only record.

Genus NEOCRIBRELLA Cushman, 1928

Neocribrella CUSHMAN, Contr. Cushman Lab. Foram. Res., vol. 4, 1928, p. 6; Special Publ. No. 1, Cushman Lab. Foram. Res., 1928, p. 280.

Discorbina (part) PARKER and JONES, Philos. Trans., vol. 155, 1865, pp. 385, 421.

Genoholotype.—Discorbina globigerinoides Parker and Jones.

Test trochoid but becoming somewhat involute in the later stages; chambers comparatively few, inflated; wall calcareous, perforate; aperture in the adult composed of several small rounded pores in a slight depression of the ventral face of the chamber.

Eocene—France.

There are no Recent species of this genus.

Family 34. AMPHISTEGINIDAE

Test trochoid, all chambers visible from the dorsal side except in involute forms of *Amphistegina*, those of the last-formed whorl only visible on the ventral side, the ventral side with angular supplementary chambers coming in between the regular series, roughly rhomboid in shape as seen from the surface; aperture typically ventral, a slightly arched opening, the area adjacent to the aperture, papillate.

This family consists of the two genera given below. The simpler of these, *Asterigerina*, is known from the Upper Cretaceous and Tertiary, and is living in the present oceans. *Amphistegina*, the more complex genus of the two, also is known from about the same geologic range. The Paleozoic records of this genus are undoubtedly erroneous. Both genera are most abundant in fairly shallow water under coral reef conditions in the tropics. The family evidently developed from the Rotaliidae.

Genus ASTERIGERINA d'Orbigny, 1839

Asterigerina D'ORBIGNY, Voy. Amér. Mérid., vol. 5, pt. 5, 1839, "Foraminifères", p. 55.—CUSHMAN, Special Publ. No. 1, Cushman Lab. Foram. Res., 1928, p. 281.

Genotype, by designation.—*Asterigerina carinata* d'Orbigny.

Test trochoid, biconvex, the ventral side usually more strongly so than the dorsal, dorsal side with the chambers appearing regularly coiled, on the ventral side with angular supplementary chambers coming in between the regular series, large and regularly rhomboid in shape; sutures on the dorsal side a simple curve; aperture on the ventral side at the base of the chamber margin.

Eocene to Recent.

The earliest record for the genus is "*Asterigerina lobata* d'Orbigny" recorded by Reuss from the Cretaceous of Germany. There are fossil species recorded from the Eocene, Oligocene, Miocene, and Pliocene. The Recent species is known from the general West Indian region and the east coast of South America. There are records from the Atlantic coast of Europe, but from the figures it seems very doubtful if they are truly *Asterigerina*.

It is very probable that the two species recorded from Dunkerque by Terquem[35] as *Asterigerina geometrica* (pl. 5, fig. 6*a*, *b*) and *A. dubia* (pl. 5, figs. 7*a*, *b*) do not belong to this genus, as well as the fossil species *A. hieroglyphica* Terquem[36] from the Pliocene of the Isle of Rhodes; *A. rhodiense* Terquem[37], and *A.* (?) *lancicula* Schwager[38] from the Eocene of Egypt. The *A. tarentina* Costa[39] from the Pliocene of Italy is hardly recognizable from the figure which like many of the figures of that work is fanciful and evidently not accurate.

The genus has been developing in the West Indian region and along the adjacent coasts of the southeastern United States since Early Tertiary times, and during this period several species were developed. Of these, few show any amount of ornamentation except *Asterigerina tuberculata* Cushman[40] from the Miocene of Santo Domingo, which is highly ornamented with knobs and bosses.

ASTERIGERINA CARINATA d'Orbigny

Plate 15, figures 4, 5

Asterigerina carinata D'ORBIGNY, in De la Sagra, Hist. Fis. Pol. Nat. Cuba, 1839, "Foraminifères," p. 118, pl. 5, fig. 25; pl. 6, figs. 1, 2.—CUSHMAN, Publ. 291, Carnegie Instit., Washington, 1919, p. 45; Proc. U. S. Nat. Mus., vol. 59, 1921, p. 60, pl. 14, figs. 6–8; Publ. 311, Carnegie Instit., Washington, 1922, p. 54, pl. 9, figs. 4–6; Special Publ. No. 1, Cushman Lab. Foram. Res., 1928, pl. 42, fig. 1; pl. 44, fig. 4.

Test unequally biconvex, coiled, the dorsal side very slightly convex, the ventral side strongly so, almost conical; chambers numerous, about 3 coils, 6 or 7 forming the last-formed coil; sutures oblique, very slightly limbate, produced to form a slight translucent keel; sutures curved and oblique on the dorsal side, on the ventral side the supplementary chambers extending nearly to the periphery, forming rhomboid areas; sutures distinct, very slightly depressed; wall smooth, finely punctate and usually glistening, often somewhat roughened by lines of small granules near the aperture, which is an elongate, narrow slit, extending from the umbilical region about halfway to the periphery, and usually with a slight, thin lip.

Specimens do not usually exceed 0.75 mm. in diameter.

The species was originally described by d'Orbigny from shore sands of Cuba and Jamaica. It is widely distributed in the West Indian region extending as far north as Cape Hatteras. At the Tortugas this species occurred at all the stations from which material was collected. It is common on the north coast of Jamaica. It occurs in the Late Tertiary of the West Indian region.

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[35] Essai Anim. Plage Dunkerque, 1875.

[36] Mém. Soc. Géol. France, sér. 3, vol. 1, 1878, p. 30, pl. 3(8), figs. 5*a*-8.

[37] Idem, p. 31, pl. 3(8), figs. 1*a*-4.

[38] Palaeontographica, vol. 30. 1883, p. 127, pl. 28(5), fig. 8.

[39] Atti Accad. Pont., vol. 8, 1856, p. 272, pl. 22, figs. 13, 14.

[40] Publ. 291, Carnegie Instit., Washington, 1919, p. 46, pl. 13, figs. 3, 4.

The species may have been recorded from the West Indies under *Amphistegina*.

It is probable that d'Orbigny's *Asterigerina lobata* from the coast of Cuba is a form of this species in which the keel was not well developed. His *A. monticula* from the coast of South America is also closely related if not identical.

Asterigerina carinata—Material examined

Catalogue No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
			Albatross	° ′ ″ ° ′ ″				
21793	U.S.N.M.	2	D2318	24 25 45 N.; 81 46 00 W	45	75	co	Rare.
21794	U.S.N.M.	2	D2355	20 56 48 N.; 86 27 00 W	399		yl. oz	Do.
21795	U.S.N.M.	10+	D2358	20 19 00 N.; 87 03 30 W	222		fne. wh. co	Abundant.
21796	U.S.N.M.	1	D2371	29 17 00 N.; 85 30 45 W	26		gy.s.,brk.sh.	Rare.
21797	U.S.N.M.	8	D2388	29 24 30 N.; 88 01 00 W	35		yls., bk. sp	Abundant.
21798	U.S.N.M.	7						
21799	U.S.N.M.	10+	D2629	23 48 40 N.; 75 10 00 W	1169	38.4	co. s	Do.
3191	J.A.C.	9	4	Dry Tortugas, Fla	1		dead coral	Common.
3192	J.A.C.	3	6	do	1		m	Rare.
3180	J.A.C.	6	8	do	1		m	Few.
3181	J.A.C.	4	9	do	1		m	Do.
3189	J.A.C.	10+	10	do	11	23.2°C.	s	Abundant.
3190	J.A.C.	10	12	do	7	23°C.	hrd	Common.
3186	J.A.C.	10+	13	do	11		fne. s	Abundant.
3187	J.A.C.	10+	14	do	12		fne. s	Do.
3188	J.A.C.	5	18	do	7		fne. s	Few.
3183	J.A.C.	4	19	do	5.75		fne. s	Do.
3184	J.A.C.	4	20	do	7		fne. s	Do.
12999	J.A.C.	1	21	do	6		fne. s	Abundant.
3185	J.A.C.	10+						
3173	J.A.C.	3	22	do	6		fne. s	Do.
3201	J.A.C.	10+						
3178	J.A.C.	10+	23	do	10.5		m. s	Do.
3179	J.A.C.	7	24	do	3.5		crs. wht. s	Common.
3182	J.A.C.	1	27	do	7		m	Rare.
3174	J.A.C.	6	28	do	4.75		fne. wh. s	Few.
3175	J.A.C.	9	30	do	2		s	Common.
3176	J.A.C.	10+	37	do	11		fne. s	Abundant.
3177	J.A.C.	9	42	do	18		s	Common.
13000	J.A.C.	5		Off Government Cut, Miami, Fla.	30			Abundant.
21800	U.S.N.M.	9						
21801	U.S.N.M.	1		do	100			Rare.
13001	J.A.C.	3		Off Miami, Fla	6			Do.
21802	U.S.N.M.	10+		do	20			Abundant.
21803	U.S.N.M.	1		Off Ajax Reef, Fla	40			Rare.
13002	J.A.C.	1		Off Turtle Harbor, Fla	20			Do.
13004	J.A.C.	4		Off Fowey, Fla	23			Few.
21804	U.S.N.M.	1		do	40			Rare.
6185	J.A.C.	1		Off Morro Castle, Havana Harbor, Cuba.				Do.
13003	J.A.C.	1						
3193	J.A.C.	6		Runaway Bay, Jamaica				Few.
3194	J.A.C.	5		Montego Bay, Jamaica	9			Do.

Genus AMPHISTEGINA d'Orbigny, 1826

Amphistegina D'ORBIGNY, Ann. Sci. Nat., vol. 7, 1826, p. 304.—H. B. BRADY, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 739.—CHAPMAN, The Foraminifera, 1902, p. 239.—CUSHMAN, Bull. 71, U. S. Nat. Mus., pt. 4, 1914, p. 35; Smithsonian Misc. Coll., vol. 77, No. 4, 1925, p. 49; Special Publ. No. 1, Cushman Lab. Foram. Res., 1928, p. 281.

Omphalophacus EHRENBERG, Abhandl. k. Akad. Wiss. Berlin, 1838, p. 132 (genoholotype, *Omphalophacus hemprichii* Ehrenberg).

Genotype, by designation.—*Amphistegina lessonii* d'Orbigny.

Test usually lenticular, trochoid, often involute on the dorsal side in the adult; supplementary chambers more or less irregularly rhomboid; sutures and chambers with a pronounced angle, no true secondary canal system developed; aperture small, ventral, the wall granular about the opening.

Tertiary to Recent.

In the more primitive species of the genus the transition from *Asterigerina* may be seen, and the test is comparatively simple. In the larger, more complex species the test becomes somewhat involute and the earlier stages are not visible. The genus is characteristic of coral reef conditions of the Tropics developing most highly in the Indo-Pacific. In various parts of the Tertiary it was often very abundant as it is today in its selected habitat.

AMPHISTEGINA LESSONII d'Orbigny

Plate 16, figures 1–3

Amphistegina lessonii d'Orbigny, Ann. Sci. Nat., vol. 7, 1826, p. 304, No. 3, pl. 17, figs. 1–4 (*Quoii* in description of plate); Modèles, No. 98, 1826.
Amphistegina gibbosa d'Orbigny, in De la Sagra, Hist. Fis. Pol. Nat. Cuba, 1839, "Foraminifères," p. 120, pl. 8, figs. 1–3.

No attempt is made here to give complete references to this species as there are several species and varieties in the present oceans especially in the Indo-Pacific. d'Orbigny gave the name *gibbosa* to his West Indian material but with rather large suites of specimens I have been unable to separate this from the Pacific form. The West Indian form is relatively small, not usually exceeding 2 millimeters and usually smaller. The structure is relatively simple and there is an umbo on both sides while the sutures are not complex. The figures will show well the characters of the West Indian form. It occurs typically in the shallow water of coral reef areas. It was abundant at the Tortugas, on the north coast of Jamaica, coasts of Cuba and Porto Rico.

Amphistegina lessonii—Material examined

Catalogue No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
			Albatross	° ′ ″ ° ′ ″				
21805	U.S.N.M.	10+	D2315	24 26 00 N.; 81 48 15 W.	37		co	Abundant.
21806	U.S.N.M.	2	D2317	24 25 45 N.; 81 46 45 W.	45	75	co	Rare.
21807	U.S.N.M.	9	D2318	24 25 45 N.; 81 46 00 W.	45	75	co	Common.
21808	U.S.N.M.	1	D2352	22 35 00 N.; 84 23 00 W.	463	45	wh. co	Rare.
21809	U.S.N.M.	1	D2358	20 19 00 N.; 87 03 30 W.	222		fne. wh. co	Do.
21810	U.S.N.M.	5	D2371	29 17 00 N.; 85 30 45 W.	26		gy.s., brk.sh.	Few.
21811	U.S.N.M.	6	D2388	29 24 30 N.; 88 01 00 W.	35		yls., bk. sp	Common.
21812	U.S.N.M.	1						
21813	U.S.N.M.	3	D2629	23 48 40 N.; 75 10 40 W.	1169	38.4	co.s	Rare.
21814	U.S.N.M.	7	D2639	25 04 50 N.; 80 15 10 W.	56		co.s	Common.
21815	U.S.N.M.	5	D2755	3 22 00 S.; 37 49 00 W.	417	40.5	gy. sp. spk	Few.
21816	U.S.N.M.	6	D2758	6 59 00 S.; 34 47 00 W.	20	79	brk. sh	Do.
3462	J.A.C.	4	6	Dry Tortugas, Fla	1		m	Do.
3463	J.A.C.	5	8	do	1		m	Do.
3464	J.A.C.	10	9	do	1		m	Common.
						° *C.*		
3465	J.A.C.	1	10	do	11	23.2	s	Rare.
3471	J.A.C.	10+	12	do	7	23	hrd	Abundant.
13005	J.A.C.	1	13	do	11		fne. s	Do.
3472	J.A.C.	10+						

Amphistegina lessonii—Material examined—Continued

Catalogue No.	Collection of	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature ° C.	Character of bottom	Abundance
3473	J.A.C.	3	14	Dry Tortugas, Fla	12	-------	fne. s	Rare.
3474	J.A.C.	4	19	do	5.75	-------	fne. s	Few.
3475	J.A.C.	2	20	do	7	-------	fne. s	Rare.
3467	J.A.C.	9	21	do	6	-------	fne. s	Common.
3466	J.A.C.	10+	22	do	6	-------	fne. s	Abundant.
3479	J.A.C.	10+	23	do	10.5	-------	m. s	Do.
3478	J.A.C.	4	27	do	3.5	-------	crs. wh. s	Few.
3469	J.A.C.	3	28	do	4.75	-------	fne. wh. s	Rare.
3476	J.A.C.	9	30	do	2	-------	s	Common.
3468	J.A.C.	6	37	do	11	-------	fne. s	Few.
3477	J.A.C.	10+	42	do	18	-------	s	Abundant.
21817	U.S.N.M.	1	----------	Off Government Cut, Miami, Fla.	30	-------	--------------	Few.
13006	J.A.C.	3						
13007	J.A.C.	1	----------	Off Sand Key, Fla	38	-------	--------------	Rare.
21818	U.S.N.M.	1	----------	Off Sambo Key, Fla	58	-------	--------------	Do.
21819	U.S.N.M.	2	----------	Off Fowey, Fla	22	-------	--------------	Do.
21820	U.S.N.M.	3	----------	do	28	-------	--------------	Do.
13008	J.A.C.	2	----------	do	52	-------	--------------	Do.
13009	J.A.C.	2	----------	do	55	-------	--------------	Do.
13010	J.A.C.	4	----------	do	60	-------	--------------	Few.
6193	J.A.C.	4	----------	Off Morro Castle, Havana Harbor, Cuba.	--------	-------	--------------	Do.
3482	J.A.C.	4	4	Largo Shoal, San Juan Harbor, P. R.	1	-------	--------------	Do.
13011	J.A.C.	10+	7	San Juan Harbor, P. R	2.5	-------	--------------	Abundant.
13012	J.A.C.	2						
3481	J.A.C.	10+	7	San Juan Harbor, P. R	2.5	-------	--------------	Do.
3484	J.A.C.	10+						
3480	J.A.C.	10+	8	do	2	-------	--------------	Do.
3483	J.A.C.	8	9	Ponce, P. R	.5	-------	--------------	Common.
3512	J.A.C.	6	----------	Montego Bay, Jamaica	9	-------	--------------	Few.
3511	J.A.C.	5	----------	Runaway Bay, Jamaica	-------	-------	--------------	Do.

AMPHISTEGINA FOVEOLATA Egger

Amphistegina foveolata EGGER, Abhandl. kön. bay. Akad. Wiss. München, Cl. II, vol. 18, 1893, p. 430, pl. 20, figs. 6–8.

Under this name Egger records a peculiar species with an ornamented surface from the west coast of Africa as well as from the Indo-Pacific. I examined the types in Egger's collection in Munich. The types are from Gazelle Station 65, and include four specimens. They have a peculiarly roughened surface similar to that given in his figures.

Egger also records *Amphistegina mamillata* d'Orbigny and *A. hauerina* d'Orbigny from off the west coast of Africa.

"AMPHISTEGINA RADIATA Terquem"

Under this name Terquem[41] figures a peculiar form from Dunkerque. The figures are very poor, and it is not identifiable.

"AMPHISTEGINA VULGARIS d'Orbigny"

Under this name Terquem[42] figures a specimen which seems to belong to this genus. As numerous fossil species are recorded in Terquem's paper, the identity of this is in much doubt. Goës also records this species from the Caribbean, but his specimens can be referred to *A. lessonii* d'Orbigny.

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[41] Essai Class. Anim. Dunkerque, 1881, p. 129, pl. 17, figs. 1 *a–c*.

[42] Idem, p. 36, pl. 5, figs. 8 *a*, *b*.

Family 35. CALCARINIDAE

Test trochoid in the early stages, soon adding a supplementary mass of shell material over which the new chambers are added, in the higher genera the chambers extending to the dorsal side and finally covering the whole test in a globular series, the test developing bosses of shell material which are the surface end of pillars, and large spines independent of the individual chambers; wall calcareous, coarsely perforate; aperture in the early trochoid stages like *Rotalia*, later consisting of numerous smaller openings; supplementary canal system well developed.

This family which developed from the spinose forms of *Rotalia* shows a progressive complexity of structure from the simpler *Calcarina* to the complex *Baculogypsina*. The large spines are developed early and are one of the striking characters of the family. The species of the various genera are characteristic of warm shallow waters, at the present time in the Indo-Pacific.

Genus CALCARINA d'Orbigny, 1826

Calcarina d'Orbigny, Ann. Sci. Nat., vol. 7, 1826, p. 276.—H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 711.—Chapman, The Foraminifera, 1902, p. 223.—Cushman, Special Publ. No. 1, Cushman Lab. Foram. Res., 1928, p. 282.

Nautilus (part) of Authors.

Genotype, by designation.—*Nautilus spengleri* Linnaeus.

Test trochoid, biconvex, with radial spines independent of the individual chambers, usually in the plane of coiling, in the early stages with the test simple, later with a supplementary mass of shell material over which the new chambers are laid on the ventral side; wall calcareous, perforate, with pillars; aperture in the adult typically a row of small openings along the inner ventral margin of the chamber.

Cretaceous to Recent. Living only in the Indo-Pacific.

Genus SIDEROLITES Lamarck, 1801

Siderolites Lamarck, Syst. Anim. sans Vert., 1801, p. 376.—Cushman, Special Publ. No. 1, Cushman Lab. Foram. Res., 1928, p. 284.

Siderolina Defrance, Dict. Sci. Nat., vol. 32, 1824, p. 180.

Calcarina (part) of Authors.

Genoholotype.—*Siderolites calcitrapoides* Lamarck.

Test in the early chambers similar to *Calcarina*, spines later added at right angles to the peripheral ones, chambers soon covering the dorsal side; wall calcareous, perforate, with pillars in some species ending at the surface in raised bosses; aperture in the adult at the basal edge of each chamber, finally represented by the larger circular openings of the chamber wall.

Cretaceous to Recent. Living only in the Indo-Pacific.

Genus PELLATISPIRA Boussac, 1906

Pellatispira Boussac, Bull. Soc. Géol. France, sér. 4, vol. 6, 1906, p. 91.—Cushman, Special Publ. No. 1, Cushman Lab. Foram. Res., 1928, p. 284.

Nummulites (part) Hantken, 1876 (not Lamarck).

Genotype, by designation.—*Pellatispira douvillei* Boussac.

Test planispiral, bilaterally symmetrical, the earliest coil with the chambers close coiled, later ones loosely coiled with a mass of shell material between, separating the coils; lateral walls with pillars, appearing as bosses at the surface.

Tertiary.

Genus BACULOGYPSINA Sacco, 1893

Baculogypsina Sacco, Bull. Soc. Belg. Géol., vol. 7, 1893, p. 206.—Cushman, Special Publ. No. 1, Cushman Lab. Foram. Res., 1928, p. 284.

Orbitolina Parker and Jones, 1860 (not d'Orbigny).

Tinoporus of Authors (not Montfort).

Genotype, by designation.—*Orbitolina sphaerulata* Parker and Jones.

Test in the early stages like *Calcarina*, very early developing four or more large spines which increase in size independent of the chambers, chambers quickly covering the whole surface, supplementary skeleton well developed, consisting of pillars at the angles of the chambers ending in rounded bosses at the surface and connected with surrounding ones by radial connecting rods giving a reticulate appearance to the test.

Tertiary and Recent. Living only in the Indo-Pacific.

Genus ARNAUDIELLA H. Douvillé, 1907

Arnaudiella H. Douvillé, Bull. Soc. Géol. France, sér. 4, vol. 6, 1907, p. 599.—Cushman, Special Publ. No. 1, Cushman Lab. Foram. Res., 1928, p. 285.

Genoholotype.—*Arnaudiella grossouvrei* H. Douvillé.

Test lenticular, the early chambers involute, later ones compressed and somewhat evolute, supplementary thin-walled chambers developed along the spiral; wall calcareous, perforate, with pillars.

Eocene.

Family 36. CYMBALOPORETTIDAE

Test in the early stages trochoid, close to *Discorbis*, in the later development the chambers generally in annular series about the periphery; wall calcareous, perforate; apertures numerous, circular pores in the adult, variously arranged; in *Tretomphalus* pelagic in the adult.

This family evidently developed from a form close to *Discorbis*, and has adopted the alternating annular series of chambers about the periphery with numerous apertures. In *Tretomphalus*, there is a very interesting adult development fitting the test for the pelagic life of the animal at this stage. See Earland, On *Cymbalopora bulloides* (d'Orbigny) and its internal structures.[43]

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[43] Journ. Quekett Micr. Club, ser. 2, vol. 8, No. 51, 1902, pp. 309–322, pl. 16.

Genus CYMBALOPORETTA Cushman, 1928

Cymbaloporetta Cushman, Contr. Cushman Lab. Foram. Res., vol. 4, 1928, p. 7; Special Publ. No. 1, Cushman Lab. Foram. Res., 1928, p. 285.

Rotalia (part) d'Orbigny.

Rosalina (part) of Authors (not d'Orbigny).

Cymbalopora of Authors (not Hagenow).

Genoholotype.—Rosalina squammosa d'Orbigny.

Test conical, the early chambers trochoid, later ones in annular series separated somewhat from one another along the periphery, with depressions between radiating from the central umbilical area, the next series of chambers placed in these depressions and filling them; wall calcareous, coarsely perforate; aperture in the adult consisting of fine rounded pores along the ventral sides of the chamber.

Cretaceous (?) to Recent.

CYMBALOPORETTA SQUAMMOSA (d'Orbigny)

Plate 16, figures 4 *a–c*

Rotalia squammosa d'Orbigny, Ann. Sci. Nat., vol. 7, 1826, p. 272, No. 8.

Rosalina squammosa d'Orbigny, in De la Sagra, Hist. Fis. Pol. Nat. Cuba, 1839, "Foraminifères," p. 91, pl. 3, figs. 12–14.

Cymbalopora squammosa Cushman, Publ. 311, Carnegie Instit., Washington, 1922, p. 41, pl. 6, figs. 4–6.

Cymbaloporetta squammosa Cushman, Contr. Cushman Lab. Foram. Res., vol. 4, 1928, p. 7; Special Publ. No. 1, Cushman Lab. Foram. Res., 1928, pl. 43, fig. 1; pl. 44, fig. 6.

Rosalina poeyi d'Orbigny, in De la Sagra, Hist. Fis. Pol. Nat. Cuba, 1839, "Foraminifères," p. 62, pl. 3, figs. 18–20.

Cymbalopora poeyi Carpenter, Parker, and Jones, Introd. Foram., 1862, p. 215, pl. 13, figs. 10–12.—Moebius, Beitr. Meeresfauna Insel Mauritius, 1880, p. 97, pl. 10, figs. 1–5.—H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 636, pl. 102, figs. 13 *a–c*.—H. B. Brady, Parker, and Jones, Trans. Zool. Soc. London, vol. 12, 1888, p. 226, pl. 46, fig. 12.—Egger, Abhandl. kön. bay. Akad. Wiss. München, Cl. II, vol. 18, 1893, p. 380, pl. 18, figs. 51, 52.—Woodward, The Observer, vol. 4, 1893, p. 176.—Chapman, Proc. Zool. Soc. London, 1895, p. 39.—Silvestri, Atti Accad. Sci. Acireale, vol. 7, 1896, p. 76.—Flint, Ann. Rep't. U. S. Nat. Mus., 1897 (1899), p. 326, pl. 72, fig. 1.—Chapman, Journ. Linn. Soc. Zool., vol. 28, 1902, pp. 189, 208, 405.—Millett, Journ. Roy. Micr. Soc., 1903, p. 696.—Dakin, Rep't. Ceylon Pearl Oyster Fisheries, 1906, p. 238.—Bagg, Proc. U. S. Nat. Mus., vol. 34, 1908, p. 156.—Sidebottom, Mem. Proc. Manchester Lit. Philos. Soc., vol. 52, No. 13, 1908, p. 10.—Schubert, Abhandl. k. k. geol. Reichs., vol. 20, pt. 4, 1911, p. 114.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 5, 1915, p. 24, pl. 10, fig. 1; pl. 14, fig. 5.—Heron-Allen and Earland, Trans. Zool. Soc. London, vol. 20, 1915, p. 687.—Sidebottom, Journ. Roy. Micr. Soc., 1918, p. 251.—Cushman, Publ. 213, Carnegie Instit., Washington, 1918, p. 289; Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 308, pl. 59, figs. 2 *a–c*.—Heron-Allen and Earland, British Antarctic Exped., Zoology, vol. 6, 1922, p. 198; Journ. Linn. Soc. Zool., vol. 35, 1924, p. 630.

Cymbalopora poeyi, var. *squammosa* Chapman, Journ. Linn. Soc. Zool., vol. 28, 1902, pp. 385, 405.

Test subconical, trochoid, dorsal side forming a cone, bluntly pointed, of variable height, ventral side flattened or very slightly concave, consisting usually of 6 or 7 chambers, of peculiar shape, widest at the outer border, thence contracted, widening again, and finally contracted again, tapering toward the center, where all are united; chambers separated by a definite depressed area; wall coarsely perforated on the dorsal side, on the ventral side the pores confined to the middle of the chambers; aperture at the margin of the base of the last-formed chamber, the thin extensions of the inner end of the chamber often arch leaving large openings at either side into a central umbilical cavity; color of the earlier portion reddish-brown, the later part white.

Diameter up to 0.75 mm.

This is one of the common and characteristic species of the West Indian region, and its range extends to the Indo-Pacific and the Mediterranean. The two names given by d'Orbigny were to distinguish the higher spired forms from the lower ones. A study of abundant West Indian specimens seems to show that this difference is one of degree only, and that there are all gradations in shape. The name *squammosa* takes precedence as it is earlier both on page and plate.

Cymbaloporetta squammosa—Material examined

Catalogue No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
			Albatross	° ′ ″ ° ′ ″				
21821	U.S.N.M.	1	D2150	13 34 45 N.; 81 21 10 W	382	45.8	wh. crs. s	Rare.
21822	U.S.N.M.	5	D2352	22 35 00 N.; 84 23 00 W	463	45	wh. co	Common.
21823	U.S.N.M.	3						
21824	U.S.N.M.	5	D2358	20 19 00 N.; 87 03 30 W	222		fne. wh. co	Few.
21825	U.S.N.M.	10+	D2388	29 24 30 N.; 88 01 00 W	35		yls., bk. sp	Abundant.
21826	U.S.N.M.	2						
21827	U.S.N.M.	4	D2629	23 48 40 N.; 75 10 40 W	1,169	38.4	co. s	Few.
21828	U.S.N.M.	1		Off Government Cut, Miami Fla.	30			Rare.
13013	J.A.C.	1		Off Fowey, Fla	55			Do.
2783	J.A.C.	8	6	Dry Tortugas, Fla	1		m	Common.
2785	J.A.C.	3	8	do	1		m	Rare.
2788	J.A.C.	9	9	do	1		m	Common.
2787	J.A.C.	1	12	do	7		hrd	Rare.
2786	J.A.C.	5	13	do	11		fne. s	Few.
2791	J.A.C.	4	14	do	12		fne. s	Do.
2790	J.A.C.	2	18	do	7		fne. s	Rare.
2789	J.A.C.	4	19	do	5.75		fne. s	Few.
2794	J.A.C.	1	20	do	7		fne. s	Rare.
2798	J.A.C.	3	21	do	6		fne. s	Abundant.
2795	J.A.C.	10+						
2796	J.A.C.	10+	22	do	6		fne. s	Do.
2784	J.A.C.	10+	23	do	10.5		m. s	Do.
2793	J.A.C.	3	27	do	7		m	Rare.
2799	J.A.C.	6	28	do	4.75		fne. s	Few.
2792	J.A.C.	6	30	do	2		s	Do.
2797	J.A.C.	1	42	do	18		s	Rare.
6192	J.A.C.	1		Off Morro Castle, Havana Harbor, Cuba.				Do.
2800	J.A.C.	9		Bogue Ids., Montego Bay, Jamaica.	1		m	Common.
2801	J.A.C.	7		Runaway Bay, Jamaica				Do.
13014	J.A.C.	2		Montego Bay, Jamaica				Rare.
13015	J.A.C.	1		Off Andros Ids., Bahamas.				Do.

d'Orbigny's original specimens were from Martinique. It is very abundant on the north coast of Jamaica, and about the Florida Keys, and is widely distributed in the general West Indian region. Pacific and Mediterranean material seems to be identical with d'Orbigny's species, but the following may be distinguished, and is probably specifically distinct.

CYMBALOPORETTA BRADYI (Cushman)

Cymbalopora poeyi (d'Orbigny), var., H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 637, pl. 102, fig. 14.—H. B. Brady, Parker, and Jones, Trans. Zool. Soc., vol. 12, 1888, p. 226, pl. 46, fig. 12.—Sidebottom, Mem. Proc. Manchester Lit. Philos. Soc., vol. 54, No. 16, 1910, p. 24.

Cymbalopora poeyi Rhumbler, Zool. Jahrb., Abt. Syst., vol. 24, 1906, p. 71, pl. 15, fig. 59.

Cymbalopora poeyi (d'Orbigny), var. *bradyi* Cushman, Bull. 71, U. S. Nat. Mus., pt. 5, 1915, p. 25, pl. 10, fig. 2; pl. 14, fig. 2; Bull. 100, vol. 4, 1921, p. 308.

Cymbalopora bradyi Cushman, Publ. 342, Carnegie Instit., Washington, 1924, p. 34, pl. 10, figs. 2–4.

Test with the chambers in a very flattened, irregular spire, numerous, as many as 10 or more in the last-formed whorl on the ventral side being visible; sutures distinct and slightly depressed; wall rather coarsely perforate.

Diameter up to 0.90 mm.

Brady, Parker, and Jones figure this form from the Abrohlos Bank off Brazil. It seems to be much more common in the Indo-Pacific than in the Atlantic.

Genus CYMBALOPORELLA Cushman, 1927

Cymbaloporella Cushman, Contr. Cushman Lab. Foram. Res., vol. 3, 1927, p. 81; Special Publ. No. 1, Cushman Lab. Foram. Res., 1928, p. 288.

Cymbalopora (part) of Authors.

Genoholotype.—Cymbalopora tabellaeformis H. B. Brady.

Test compressed, the early chambers trochoid, later ones in annular series, those of each series somewhat alternating; wall calcareous, coarsely perforate; apertures in the adult consisting of a vertical series of small circular openings on the sides of the peripheral face of each chamber.

Late Tertiary and Recent. Living only in the Indo-Pacific.

Genus HALKYARDIA Heron-Allen and Earland, 1919

Halkyardia Heron-Allen and Earland, Mem. Proc. Manchester Lit. Philos. Soc., vol. 62, 1917–18 (1919), p. 107.—Cushman, Special Publ. No. 1, Cushman Lab. Foram. Res., 1928, p. 288.

Cymbalopora Liebus, 1911 (not Hagenow).

Genotype, by designation.—*Cymbalopora radiata*, var. *minima* Liebus.

Test biconvex, early chambers trochoid, later ones in annular series extending ventrally to the umbilical area, the dorsal side of earlier chambers somewhat hidden by a later covering of shell material, umbilical area filled by shell material with fine tubules, the exterior standing out as a rounded boss.

Eocene.

Genus TRETOMPHALUS Moebius, 1880

Tretomphalus Moebius, Foram. Insel Mauritius, 1880, p. 98.—Cushman, Special Publ. No. 1, Cushman Lab. Foram. Res., 1928, p. 288.

Rosalina (part) d'Orbigny, 1839.

Cymbalopora (part) of Authors (not Hagenow).

Genoholotype.—*Rosalina bulloides* d'Orbigny.

Test free, early stages *Discorbis*-like in a flattened trochoid arrangement, later in some forms like *Cymbalopora* with alternating series of annular chambers; wall calcareous, perforate; in the adult developing a large semiglobular "float chamber," an interior, entirely globular or lobed chamber with a valve-like opening inside the outer wall which is provided with numerous large rounded pores on the outer face, the test at this stage becoming pelagic.

Recent.

TRETOMPHALUS BULLOIDES (d'Orbigny)

Plate 16, figures 5 *a–c*

Rosalina bulloides d'Orbigny, in De la Sagra, Hist. Fis. Pol. Nat. Cuba, 1839, "Foraminifères," p. 104, pl. 3, figs. 2–5.

Cymbalopora bulloides Carpenter, Parker, and Jones, Introd. Foram., 1862, p. 216.—H. B. Brady, Quart. Journ. Micr. Soc., vol. 19, 1879, p. 80; Rep. Voy *Challenger*, Zoology, vol. 9, 1884, p. 638, pl. 102, figs. 7–12, text figs. 20 *a–c*.—Egger, Abhandl. kön. bay. Akad. Wiss. München, Cl. II, vol. 18, 1893, p. 381, pl. 18, fig. 53.—Woodward, The Observer, vol. 4, 1893, p. 176.—Chapman, Proc. Zool. Soc. London, 1895, p. 39.—Murray, Nat. Sci., vol. 11, 1897, p. 20, fig. 3 (in text).—Chapman, Journ. Linn. Soc. London, Zoology, vol. 28, 1902, pp. 189, 208, 405.—Earland, Journ. Quekett Micr. Club, ser. 2, vol. 8, 1902, p. 309, pl. 16, figs. 6–9.—Rhumbler, Zool. Jahrb., Abt. Syst., vol. 24, 1906, p. 72.—Sidebottom, Mem. Proc. Manchester Lit. Philos. Soc., vol. 52, No. 13, 1908, p. 10.—Pearcey, Trans. Roy. Soc. Edinburgh, vol. 49, 1914, p. 1040.—Heron–Allen and Earland, Trans. Zool. Soc. London, vol. 20, 1915, p. 688.—Heron-Allen, Philos. Trans., vol. 206, 1915, p. 252; et seq., pls. 16, 17 (part).—Heron-Allen and Earland, British Antarctic Exped., Zoology, vol. 6, 1922, p. 199.

Tretomphalus bulloides Moebius, Beitr. Meeresfauna Insel Mauritius, 1880, p. 98, pl. 10, figs. 6–9.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 5, 1915, p. 26, pl. 14, figs. 3, 4, fig. 29 (in text); Proc. U. S. Nat. Mus., vol. 59, 1921, p. 58, pl. 13, fig. 13; Publ. 311, Carnegie Instit., Washington, 1922, p. 42, figs. 2, 3 (in text); Publ. 342, 1924, p. 36, pl. 11, figs. 1–3.—Cushman and Wickenden, Proc. U. S. Nat. Mus., vol. 75, art. 9, 1929, p. 12, pl. 5, figs. 2–4.—Cushman and Kellett, Proc. U. S. Nat. Mus., vol. 75, art. 25, 1929, p. 13.

Discorbina bulloides Goës, Kongl. Svensk. Vet. Akad. Handl., vol. 19, 1882, p. 106, pl. 8, figs. 262, 263.

Test free, subglobular; early chambers rotaliform, numerous, rather coarsely perforate, forming a cap to which is attached a large final "balloon-chamber," subspherical, with coarse perforations on the ventral side, and within, a "float-chamber" with a single opening at the base, from which a tubular neck projects inward; color of the early chambers dark brown, the large chamber colorless.

Diameter up to 0.40 mm.

From the synonymy given above, it will be seen that there are many records for this species which apparently lives on the bottom or attached during its early stages, then develops the float-chamber and becomes free and pelagic. The empty test may float for a considerable time as Woodward records it from the south side of Cape Cod off Marthas Vineyard. I have not found it in any *Albatross* bottom samples from this region, but it is possible that it may be driven in as is the Gulf-weed, *Physalia,* and other typical Gulf-stream species with favorable winds. I have collected dozens of *Physalia* in Vineyard Sound under such conditions, and it may be that at such times tests of *Tretomphalus* may be brought in. Its typical habitat however is in tropical waters. In the Indo-Pacific it also occurs, and is accompanied by other species.

Moebius (1880) has given an account, and figures of the structure of this species as have Earland (1902) and Heron-Allen (1915). In my Tortugas paper (1922) I have given a series of notes on the studies of this species at the Tortugas Laboratory which are copied here.

d'Orbigny originally described this species as *Rosalina bulloides* in the Cuban monograph, his specimens being from Cuba and Haiti. By most authors it has been assigned to *Cymbalopora,* but Moebius in 1880 erected the genus *Tretomphalus* for this species, and in view of the structures revealed by later studies it seems best to use this name. The *Cymbalopora millettii* of Heron-Allen and Earland should also be known as *Tretomphalus millettii.* These two species have had considerable attention from various authors, especially Moebius, Murray, Brady, Earland, and Heron-Allen.

Tretomphalus bulloides occurs both as a pelagic species and as a bottom form. This fact has led to various theories concerning its life history. From what is known of the pelagic form, it undoubtedly becomes empty and sinks to the bottom. Whether or not all the bottom specimens may thus be accounted for can not be stated with any degree of certainty. It seems possible that the enlarged "balloon-chamber" is developed from a bottom-living form, as many species adapted to a pelagic life develop a more or less inflated final chamber with large pores. These evidently allow free passage of the protoplasm, which, being extended and containing gases, floats the test without difficulty. Sir John Murray, while on the *Challenger*, observed living specimens of *Tretomphalus bulloides*, filled with "flagelli spores (?)" which were then noted and have since been referred to by various authors. These had small bodies at one side which took stain more freely than the general mass.

In the tow-nets in the work at the Tortugas I frequently took *Tretomphalus bulloides* at the surface, especially in the open waters off Loggerhead Key. Some of these had the "float-chamber" containing a large air (?) bubble about half the diameter of the test. Murray also noted this in his fresh material. In these pelagic specimens there were often swarms of what were apparently zoospores, capable of rapid movement, but showing no flagellae or cilia, so far as could be observed. It was suggested by Earland that these might be discharged and on rupture of the "balloon-chamber" the upper rotaliform portion might settle down to the bottom again and live on as *Discorbis* or as *Cymbalopora poeyi*. My own observations would tend to disprove this, for in all the specimens observed no protoplasmic mass was left in the rotaliform portion, this also being filled with zoospores, as was shown by crushing this part when none were observed in the "float-chamber." On crushing such specimens, numbers of zoospores came from the smaller chambers of the rotaliform portion, but no undifferentiated protoplasm. Murray has already noted that none of his pelagic specimens contained the ordinary form of protoplasm seen in the other foraminifera. These zoospores are so minute (0.001 to 0.0015 mm.) that they could easily pass through the pores of the spherical "balloon-chamber" and to it from any part of the rotaliform portion through the apertures of the early chambers.

In connection with this, another very interesting fact was noted in regard to the coloration of the initial portion of the test. It has been assumed by most writers that the color of the test in certain of the Rotaliidae, for example in *Discorbis*, was due to the contained protoplasm. I had supposed that the specimens with deep color were specimens in the living condition when taken. Heron-Allen makes a similar note[44] in speaking of *Tretomphalus bulloides* as follows:

"The color varies from pure white to a deep brown, owing to the contained protoplasm, which is frequently as dark as in *Discorbina mediterranensis* (d'Orbigny) and therefore of that group."

Tretomphalus bulloides—Material examined

Cat. No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
			Albatross	° ′ ″ ° ′ ″				
21829	U.S.N.M.	10	D2352	22 35 00 N.; 84 23 00 W	463	45	wh. co	Abundant.
21830	U.S.N.M.	9						
21831	U.S.N.M.	2	D2761	15 39 00 S.; 38 32 54 W	818	39	pter. oz	Rare.
12931	J.A.C.	1		Bermuda				Do.

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[44] Philos. Trans. vol., 26, 1915, p. 257, footnote, p. 257.

In crushing specimens which had a series of dark brown chambers in the rotaliform portion, I found a thin, nearly transparent brown lining that could be separated from the interior of these chambers, after which they were white. This lining seemed structureless, suggesting a chitinous character, and appeared to be the source of the color in the chambers. The specimens had been dried and the lining was of uniform character and thickness, and could scarcely have been dried protoplasm. It may be suggested that a similar condition should be looked for in other colored Rotaliidae, especially where the early chambers only are colored.

When the "float-chamber" was removed the under side of the rotaliform portion had an appearance very different from even the small specimens of *Cymbalopora poeyi*. The suggestion that *Tretomphalus bulloides* is a stage of *Cymbalopora*, or of *Planorbulina*, or of *Discorbis*, does not seem to hold in the Tortugas region. All the pelagic specimens of *Tretomphalus bulloides* were much smaller than those of *Cymbalopora poeyi*, and had a different shape and general character. The ventral side does resemble that of *Cymbalopora poeyi*, but only in a general way. It may be that these small forms are all megalospheric and are thus producing the sexual zoospores for the formation of the microspheric generation, but no specimens referable to the latter were found in the tow-nets during my stay at the Tortugas.

A peculiar character of the pores of the test was noted. The early chambers have comparatively large pores, which increase in numbers but decrease in size in the succeeding chambers until in the "balloon-chamber" they are very fine, except for the large pores at the base.

Families 37, 38, and 39 are already discussed in part 7.

Family 40. GLOBOROTALIIDAE

Test in the early stages trochoid, the chambers with a rough, cancellated exterior and often spinose, in the adult resuming the ancestral rotalid form or becoming annular, but often retaining the rough, spinose surface; aperture typically opening into the umbilical area, the older species often retaining the covering above the umbilical area, and traces of it appear in the living forms; largely pelagic.

This family evidently represents a return to the rotalid ancestry of *Globigerina*, that of a *Discorbis*-like test.

The compressed forms seen in many of the species of this family have been included in the Globigerinidae, and some of those which have been referred to *Pulvinulina* in the literature do not fit at all the forms now included under *Eponides*. The pelagic habit of many of these species, and their association with the Globigerinidae in both Recent and fossil *Globigerina* marls and oozes, show their close relationship. By reversion to the ancestral form this group helps to make clear the fact that the Globigerinidae have developed from the Rotaliidae as a specialized group adapting themselves to a pelagic condition. In *Cycloloculina,* there is developed the annular form which in its apertural characters allies it more or less closely to *Orbulina,* and by its spinose condition to the others of the Globorotaliidae. *Sherbornina* is apparently close to *Cycloloculina.*

KEY TO THE GENERA

I. Test trochoid throughout.
  A. Periphery truncate, usually with a double keel........*Globotruncana*
  B. Periphery acute or rounded, with a single keel..........*Globorotalia*
II. Test becoming annular.
  A. A single layer of chambers............................*Cycloloculina*
  B. Chamberlets on the flattened surface..................*Sherbornina*

Genus GLOBOTRUNCANA Cushman, 1927

Globotruncana Cushman, Contr. Cushman Lab. Foram. Res., vol. 3, 1927, p. 91; Special Publ. No. 1, Cushman Lab. Foram. Res., 1928, p. 311.
Rosalina (part) of Authors.
Discorbina (part) of Authors.
Globigerina (part) of Authors.
Rotalia (part) of Authors.
Pulvinulina (part) of Authors.

Genoholotype.—Pulvinulina arca Cushman.

Test trochoid in the young the chambers usually globose, rough and cancellated, the adult usually much compressed, the dorsal and ventral sides either flat or convex, ventral side sometimes slightly concave, the periphery truncate, usually with a double keel on the dorsal and ventral sides; aperture on the ventral side, often in well preserved specimens with a thin plate-like structure over the umbilical area; apparently pelagic in part.

Upper Cretaceous to Recent.

GLOBOTRUNCANA LINNAEANA (d'Orbigny)

Rosalina linnaeana d'Orbigny, in De la Sagra, Hist. Fis. Pol. Nat. Cuba, 1839, "Foraminifères," p. 101, pl. 5, figs. 10–12.

This species is described as excessively rare in shore sands of Cuba. No similar specimens have occurred in all my shallow water collections from the West Indies nor have specimens been found in any of the many *Albatross* dredgings from this same region. Its resemblance to the Upper Cretaceous species of this genus leads one to the conclusion that it may have been derived from Cretaceous sediments.

Some of the specimens now found living in the Indo-Pacific may possibly belong in this genus, but there seems to be no living representative in the western Pacific.

Genus GLOBOROTALIA Cushman, 1927

Globorotalia Cushman, Contr. Cushman Lab. Foram. Res., vol. 3, 1927, p. 91; Special Publ. No. 1, Cushman Lab. Foram. Res., 1928, p. 312.
Rotalia (part) of Authors.
Rotalina (part) of Authors.
Planulina (part) of Authors.
Pulvinulina (part) of Authors.

Genoholotype.—Pulvinulina menardii, var. *tumida* H. B. Brady.

Test trochoid, the earliest chambers often like *Globigerina,* with a rough cancellated exterior, biconvex, on the dorsal side more or less flattened with the ventral side strongly convex; wall calcareous perforate, frequently spinose in whole or in restricted areas; aperture large, opening into the umbilicus which is either open or partially covered by a lip.

Upper Cretaceous to Recent.

This genus is derived from the Globigerinidae, and like many of the members of that family seems to be adapted to pelagic conditions as were many of the fossil species.

GLOBOROTALIA MENARDII (d'Orbigny)

Plate 17, figures 1 *a–c*

Rotalia menardii d'Orbigny, Ann. Sci. Nat., vol. 7, 1826, p. 273, No. 26; Modèles No. 10.

Pulvinulina repanda, var. *menardii* Parker and Jones, Philos. Trans., vol. 155, 1865, p. 394, pl. 16, figs. 35–37.

Pulvinulina menardii Owen, Journ. Linn. Soc. Zool., vol. 9, 1867, p. 148, pl. 5, fig. 16.—Thomson, Proc. Roy. Soc., vol. 23, 1875, p. 37, pl. 3, figs. 1, 2; Rep. Voy. *Challenger*, 1877, p. 218, figs. 48 *a, b*.—Broeck, Bull. Soc. Etude Sci. Nat. Nimes, 6 Annes, 1878, p. 20.—Goës, Kongl. Svensk. Vet. Akad. Handl., vol. 19, No. 4, 1882, p. 112, pl. 8, figs. 289–295.—H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 690, pl. 103, figs. 1, 2.—Balkwill and Wright, Trans. Roy. Irish Acad., vol. 28, Sci., 1885, p. 351.—Malagoli, Boll. Soc. Geol. Ital., vol. 6, 1887, p. 523, pl. 13, fig. 10.—H. B. Brady, Parker, and Jones, Trans. Zool. Soc., vol. 12, 1888, p. 228, pl. 46, fig. 3.—H. B. Brady, Quart. Journ. Geol. Soc., vol. 44, 1888, p. 10.—Woodward, The Observer, vol. 4, 1893, p. 177.—Egger, Abhandl. kön. bay. Akad. Wiss. München, Cl. II, vol. 18, 1893, p. 411, pl. 17, figs. 1–3, 7–12.—Chapman, Proc. Zool. Soc. London, 1895, p. 42.—Goës, Bull. Mus. Comp. Zoöl., vol. 29, 1896, p. 75.—Burrows and Holland, Proc. Geol. Assoc., vol. 15, 1897, p. 48, pl. 2, fig. 22.—Flint, Ann. Rep't. U. S. Nat. Mus., 1897 (1899), p. 329, pl. 73, fig. 3.—Kiaer, Rep't. Norwegian Fish. and Mar. Invest., vol. 1, No. 7, 1900, p. 47.—Rhumbler, Nordische Plankton, pt. 14, Foraminiferen, 1901, p. 14, figs. 6–8 (in text).—Fornasini, Mem. Accad. Sci. Istit. Bologna, ser. 5, vol. 10, 1902, p. 58, fig. 55 (in text).—Chapman, Journ. Linn. Soc. Zool., vol. 28, 1902, p. 406.—Liebus, Jahrb. geol. k. k. Reichsanst., vol. 52, 1903, p. 99.—Millett, Journ. Roy. Micr. Soc., 1904, p. 499.—Earland, Journ. Quekett Micr. Club, 1905, p. 227.—Dakin, Rep't. Pearl Oyster Fisheries Ceylon, 1906, p. 239.—Bagg, Proc. U. S. Nat. Mus., vol. 34, 1908, p. 162.—Heron-Allen and Earland, Journ. Roy. Micr. Soc., 1909, p. 685.—Chapman, Journ. Linn. Soc. Zool., vol. 30, 1910, p. 422.—Schubert, Abhandl. k. k. Geol. Reichsanst., vol. 20, 1911, p. 110, pl. 1, fig. 2; pl. 5, fig. 1M.—Heron-Allen and Earland, Trans. Zool. Soc. London, vol. 20, 1915, p. 715.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 5, 1915, p. 54, pl. 22, fig. 2.—Heron-Allen and Earland, Journ. Roy. Micr. Soc., 1916, p. 51.—Cushman, Bull. 103, U. S. Nat. Mus., 1918, p. 71, pl. 25, figs. 2, 3; Bull. 676, U. S. Geol. Surv., 1918, p. 65, pl. 22, fig. 1 *a–c*.—Sidebottom, Journ. Roy. Micr. Soc., 1918, p. 259.—Cushman, Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 333, pl. 66, figs. 1 *a–c;* Publ. 311, Carnegie Instit. Washington, 1922, p. 50, pl. 8, figs. 3, 4; U. S. Geol. Surv., Prof. Paper 133, 1923, p. 45.—Koch, Ber. Schweiz. Pal. Ges., vol. 18, 1923, p. 356.—Hanzawa, Jap. Journ. Geol. Pal., vol 4, 1925 (1926), p. 44.—Yabe and Hanzawa, Jap. Journ. Geol. Pal., vol. 4, 1925 (1926), p. 52.—Nuttalll, Quart. Journ. Geol. Soc., vol. 84, 1928, p. 101, pl. 7, fig. 20.

Globorotalia menardii Cushman, Bull. Scripps Instit. Oceanography, Tech. Ser., vol. 1, No. 10, 1927, p. 175.—Cushman and Wickenden, Proc. U. S. Nat. Mus., vol. 75, art. 9, 1929, p. 13, pl. 6, figs. 2 *a–c*.

Rotalina cultrata Bailey, Smithsonian Contrib., vol. 2, art. 3, 1851, p. 11, pl., figs. 14–16.

Pulvinulina menardii, var. *cultrata* Broeck, Ann. Soc. Belg. Micr., vol. 2, 1876, p. 141, pl. 3, figs. 13, 15.

Rotalina canariensis d'Orbigny, in Barker-Webb and Berthelot, Hist. Nat. Iles Canaries, vol. 2, pt. 2, "Foraminifères," 1839, p. 130, pl. 1, figs. 34–36.

Test plano-convex, compressed, dorsal side slightly convex, ventral side flat or somewhat concave, umbilicate, peripheral margin thin, slightly lobulated, carinate; chambers usually six in the last-formed coil; sutures somewhat depressed, especially below, on the dorsal side limbate and curved, ventrally simply depressed, straight, in a radial position; wall usually smooth and punctate, but sometimes slightly granular; aperture a rather well-developed opening at the umbilical end of the chamber, with a projecting valvular lip.

This is a very abundant species of *Globigerina*-ooze of the western Atlantic. There seems to be a maximum size reached by this species in the Caribbean, and northward and southward the specimens are smaller.[45]

This species occurs in the later Tertiary of the coastal plain of the United States and elsewhere. It is related to *Globorotalia membranacea* (Ehrenberg) which was widely distributed in the *Globigerina*-ooze of the Upper Cretaceous of widely separated regions.

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[45] See Cushman and Harris, The Significance of Relative Measurements in the Study of Foraminifera, Contr. Cushman Lab. Foram. Res., vol. 2, pt. 4, 1927, p. 92.

Globorotalia menardii—Material examined

Catalogue No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
			Albatross	° ′ ″ ° ′ ″				
20957	U.S.N.M.	2	D2003	37 16 30 N.; 74 20 36 W.	641			Rare.
20958	U.S.N.M.	10+	D2018	37 12 22 N.; 74 20 04 W.	788	39	bu. m	Abundant.
20959	U.S.N.M.	10+	D2034	39 27 10 N.; 69 56 20 W.	1346	38	glob. oz	Do.
20960	U.S.N.M.	4	D2035	39 26 16 N.; 70 02 37 W.	1362		glob. oz	Few.
20961	U.S.N.M.	4	D2036	38 52 40 N.; 69 24 40 W.	1735	38	glob. oz	Do.
20962	U.S.N.M.	10+	D2037	38 53 00 N.; 69 23 30 W.	1731	38	glob. oz	Abundant.
20963	U.S.N.M.	10+	D2038	38 30 30 N.; 69 08 25 W.	2033		glob. oz	Do.
20964	U.S.N.M.	10+	D2039	38 19 26 N.; 68 20 20 W.	2369		glob. oz	Do.
20965	U.S.N.M.	10+	D2041	39 22 50 N.; 68 25 00 W.	1608	38	glob. oz	Do.
20966	U.S.N.M.	10+	D2042	39 33 00 N.; 68 26 45 W.	1555	38.5	glob. oz	Do.
20967	U.S.N.M.	10+	D2042	39 33 00 N.; 68 26 45 W.	1555	38.5	glob. oz	Do.
20968	U.S.N.M.	10+	D2050	39 42 50 N.; 69 21 20 W.	1050	44.5	glob. oz	Do.
20969	U.S.N.M.	10+	D2052	39 40 05 N.; 69 21 25 W.	1098	45	glob. oz	Do.
20970	U.S.N.M.	10+	D2097	37 56 20 N.; 70 57 30 W.	1917		glob. oz	Do.
20971	U.S.N.M.	10+	D2099	37 12 20 N.; 69 39 00 W.	2949		glob. oz	Do.
20972	U.S.N.M.	10+	D2105	37 50 00 N.; 73 03 50 W.	1395	41	glob. oz	Do.
20973	U.S.N.M.	10+	D2106	37 41 20 N.; 73 03 20 W.	1497	42.5	glob. oz	Do.
20974	U.S.N.M.	10+	D2117	15 24 20 N.; 63 31 30 W.	683	39.8	yl. m., fne. s	Do.
20975	U.S.N.M.	10+	D2140	17 36 10 N.; 76 46 05 W.	966	39.7	s	Do.
20976	U.S.N.M.	10+	D2144	9 49 00 N.; 79 31 30 W.	896		gn. m	Do.
20977	U.S.N.M.	10+	D2150	13 34 45 N.; 81 21 10 W.	382	45.8	nh. crs. s	Do.
20978	U.S.N.M.	4	D2160	23 10 31 N.; 82 20 37 W.	167		co	Few.
20979	U.S.N.M.	10+	D2189	39 49 30 N.; 70 26 00 W.	600	39.7	gn. m., s	Abundant.
20980	U.S.N.M.	10+	D2192	39 46 30 N.; 70 14 45 W.	1060	38.6	gy. oz	Do.
20981	U.S.N.M.	10+	D2205	39 35 00 N.; 71 18 45 W.	1073	38.1	gy. oz	Do.
20982	U.S.N.M.	10+	D2208	39 33 00 N.; 71 16 15 W.	1178	38.4	gn. m	Do.
20983	U.S.N.M.	3	D2212	39 59 30 N.; 70 30 45 W.	428	40	gn. m	Rare.
20984	U.S.N.M.	10+	D2217	39 47 20 N.; 69 31 15 W.	924	38.1	gy. m	Abundant.
20985	U.S.N.M.	10+	D2224	36 16 30 N.; 68 21 00 W.	2574	36.8	glob. oz	Do.
20986	U.S.N.M.	10+	D2225	36 05 30 N.; 69 51 45 W.	2512	36.7	yl. oz	Do.
20987	U.S.N.M.	10+	D2226	37 00 00 N.; 71 54 00 W.	2045	36.8	glob. oz	Do.
20988	U.S.N.M.	10+	D2234	39 09 00 N.; 72 03 15 W.	810	38.6	gn. m	Do.
20989	U.S.N.M.	10+	D2262	39 54 45 N.; 69 29 45 W.	250	41.6	gn. m., s	Do.
20990	U.S.N.M.	10+	D2312	32 54 00 N.; 77 53 30 W.	88	57.8	crs. s., bk. sp	Do.
20991	U.S.N.M.	10+	D2313	32 53 00 N.; 77 53 00 W.	99	57.2	crs. s., bk. sp	Do
20992	U S.N.M.	4	D2314	32 43 00 N.; 77 51 00 W.	159	47.4	crs. s., bk. sp	Few.
20993	U.S.N.M.	10+	D2335	33 10 39 N.; 82 20 21 W.	204			Abundant.
20994	U.S.N.M.	10+	D2352	22 35 00 N.; 84 23 00 W.	463	45	wh. co	Do.
20995	U.S.N.M.	8	D2352	22 35 00 N.; 84 23 00 W.	463	45	wh. co	Do.
20996	U.S.N.M.	3	D2355	20 56 48 N.; 86 27 00 W.	399		yl. oz	Rare.
20997	U.S.N.M.	10+	D2358	20 19 00 N.; 87 03 30 W.	222		fne. wh. co	Abundant.
21832	U.S.N.M.	7	D2377	29 07 30 N.; 88 08 00 W.	210	67	gy. m	Common.
20998	U.S.N.M.	10+	D2381	28 05 00 N.; 87 56 15 W.	1330		lt. br. m	Abundant.
20999	U.S.N.M.	10+	D2382	28 19 45 N.; 88 01 30 W.	1255	39.6	gy. m	Do.
21000	U.S.N.M.	7	D2388	29 24 30 N.; 88 01 00 W.	35		yl. s., bk. sp	Common.
21001	U.S.N.M.	10+	D2392	28 47 30 N.; 87 27 00 W.	724	40.7	br. gy. m	Abundant.
21002	U.S.N.M.	10+	D2393	28 33 00 N.; 87 14 30 W.	525	41.1	lt. gy. m	Do.
21003	U.S.N.M.	10+	D2394	28 38 30 N.; 87 02 00 W.	420	41.8	gn. m	Do.
21004	U.S.N.M.	10+	D2395	28 36 15 N.; 86 50 00 W.	347	44.1	gy. m	Do.
21005	U.S.N.M.	10+	D2398	28 45 00 N.; 86 26 00 W.	227	48.6	gy. m	Do.
21006	U.S.N.M.	10+	D2399	28 44 00 N.; 86 18 00 W.	196	57.6	gy. m	Do.
21007	U.S.N.M.	10+	D2400	28 41 00 N.; 86 07 00 W.	169		gy. m	Do.
21008	U.S.N.M.	10+	D2416	31 26 00 N.; 79 07 00 W.	276	53.8	co., brk. sh	Do.
21009	U.S.N.M.	10	D2530	40 53 30 N.; 66 24 00 W.	956	38.4	gy. oz	Common..
21010	U.S.N.M.	10+	D2542	40 00 15 N.; 70 42 20 W.	129	47.2	s., brk. sh	Abundant.
21011	U.S.N.M.	10+	D2550	39 44 30 N.; 70 30 45 W.	1081	38.5	br. m	Do.
21012	U.S.N.M.	10+	D2562	39 15 30 N.; 71 25 00 W.	1434	37.3	gy. oz	Do.
21013	U.S.N.M.	10+	D2563	39 18 30 N.; 11 23 30 W.	1422	37.4	gy. oz	Do.
21014	U.S.N.M.	10+	D2564	39 22 00 N.; 71 23 30 W.	1390	37.3	gy. oz	Do.
21015	U.S.N.M.	10+	D2568	39 15 00 N.; 68 08 00 W.	1781	36.9	gy. oz	Do.
21016	U.S.N.M.	3	D2570	39 54 00 N.; 67 05 30 W.	1813	36.8	glob. oz	Rare.
21017	U.S.N.M.	10+	D2573	40 34 18 N.; 66 09 00 W.	1742	37.3	gy. m., s	Abundant.
21018	U.S.N.M.	5	D2573	40 34 18 N.; 66 09 00 W.	1742	37.3	gy. m., s	Do.
21019	U.S.N.M.	10+	D2585	39 08 30 N.; 72 17 00 W.	542	39	dk. gy. m	Do.
21020	U.S.N.M.	10+	D2586	39 02 40 N.; 72 40 00 W.	328	40.2	dk. gy. m	Do.
21021	U.S.N.M.	10+	D2614	34 09 00 N.; 76 02 00 W.	168		gy. s., bk. sp	Do.
21022	U.S.N.M.	5	D2639	25 04 50 N.; 80 15 10 W.	56		co. s	Few.
21023	U.S.N.M.	10+	D2641	25 11 30 N.; 80 10 00 W.	60	69.2	co. s	Abundant.
21024	U.S.N.M.	10+	D2644	25 40 00 N.; 80 00 00 W.	193	43.4	gy. s	Do.
21025	U.S.N.M.	10	D2659	28 32 00 N.; 78 42 00 W.	509	45.2	br. for	Common.
21026	U.S.N.M.	10	D2660	28 40 00 N.; 78 46 00 W.	504	45.7	yl. for	Do.
21027	U.S.N.M.	10+	D2668	30 58 30 N.; 79 38 30 W.	294	46.3	gy. s., dd. co	Abundant.
21028	U.S.N.M.	10+	D2677	32 39 00 N.; 76 50 30 W.	478	39.3	gn. m	Do.
21029	U.S.N.M.	10+	D2678	32 40 00 N.; 76 40 30 W.	731	38.7	H. gy. oz	Do
21030	U.S.N.M.	9	D2679	32 40 00 N.; 76 40 30 W.	782	38.6	H. gy. oz	Common.
21031	U S.N.M.	4	D2706	41 28 30 N.; 65 35 30 W.	1188		gy. oz., for	Few.
21032	U.S.N.M.	10+	D2713	38 20 00 N.; 70 08 30 W.	1859		br. oz	Abundant.
21033	U.S.N.M.	10	D2714	38 22 00 N.; 70 17 30 W.	1825		br. oz	Common.
21034	U.S.N.M.	10+	D2716	38 29 30 N.; 70 57 00 W.	1631		br oz., for	Abundant.

Globorotalia menardii—Material examined—Continued

Catalogue No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
			Albatross	° ′ ″ ° ′ ″				
21035	U.S.N.M.	9	D2739	37 34 30 N.; 73 58 00 W.	811	38.2	gy. m	Common.
21036	U.S.N.M.	10+	D2748	39 31 00 N.; 71 14 30 W.	1163	37.8	gy. m., for.	Abundant.
21037	U.S.N.M.	10+	D2751	16 54 00 N.; 63 12 00 W.	687	40	bu. glob. oz.	Do.
21038	U.S.N.M.	10+	D2754	11 40 00 N.; 58 33 00 W.	880	38	glob. oz	Do.
21039	U.S.N.M.	10+	D2756	3 22 00 S.; 37 49 00 W.	417	40.5	gy. sp	Do.
21040	U.S.N.M.	10	D2760	12 07 00 S.; 37 17 00 W.	1019	39.5	br. co	Common.
21041	U.S.N.M.	2	D2761	15 39 00 S.; 38 32 54 W.	818	39	pter. oz	Rare.
21042	U.S.N.M.	2	D2763	24 17 00 S.; 42 48 30 W.	671	37.9	br. glob. oz.	Do.
13017	J.A.C.	1		Off Marthas Vineyard, Mass.	100		yl. m	Do.
21833	U.S.N.M.	10+		Off Ragged Reef, Fla	70			Abundant.
13016	J.A.C.	1		Off Ragged Key, Fla	71			Rare.
21834	U.S.N.M.	10+		Off Ragged Reef, Fla	75			Abundant.
13022	J.A.C.	4		Off Ragged Key, Fla	75			Do.
21835	U.S.N.M.	6		do	80			Few.
13021	J.A.C.	7		Off Ragged Reef, Fla	85			Common.
13020	J.A.C.	3		Off Sand Key, Fla	38			Rare.
13019	J.A.C.	8		do	72			Few.
13018	J.A.C.	4		Off Long Reef, Fla	40			Do.
21836	U.S.N.M.	9		Off Ajax Reef, Fla	40			Common.
21837	U.S.N.M.	4		Off Sambo Key, Fla	50			Few.
21838	U.S.N.M.	10+		do	58			Abundant.
21839	U.S.N.M.	4		Off Gov't. Cut, Miami, Fla.	30			Few.
21840	U.S.N.M.	7		do	100			Common.
21841	U.S.N.M.	8		Off Bell, Fowey, Fla	22			Do.
21842	U.S.N.M.	2		do	40			Rare.
21843	U.S.N.M.	10+		do	45			Abundant.
21844	U.S.N.M.	1		do	45			Do.
13023	J.A.C.	10+		do	52			Do.
13024	J.A.C.	6		do	55			Do.
13025	J.A.C.	8		do	55			Do.
13026	J.A.C.	7		do	60			Common.
21845	U.S.N.M.	10+		do	70			Abundant.
21846	U.S.N.M.	5		do	73			Few.
21847	U.S.N.M.	5		do	120			Do.
21848	U.S.N.M.	3		Off Key West, Fla	65			Rare.
13139	J.A.C.	3		do	78			Do.
3059	J.A.C.	2	37	Dry Tortugas, Fla	11		fne. s	Do.

GLOBOROTALIA MENARDII (d'Orbigny), var. FIMBRIATA (H. B. Brady)

Plate 17, figures 2 *a*, *b*

Pulvinulina menardii d'Orbigny, var. *fimbriata* H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 691, pl. 103, figs. 3 *a*, *b*.—Woodward, The Observer, vol. 4, 1893, p. 177.—Egger, Abhandl. kön. bay. Akad. Wiss. München, Cl. II, vol. 18, 1893, p. 412, pl. 17, fig. 19.—Chapman, Proc. Zool. Soc. London, 1895, p. 42.—Flint, Rept. U. S. Nat. Mus., 1897 (1899), p. 329, pl. 73, fig. 4.—Rhumbler, Nordische Plankton, pt. 14, Foraminiferen, 1901, p. 16, fig. 9 (in text).—Millett, Journ. Roy. Micr. Soc., 1904, p. 499.—Bagg, Proc. U. S. Nat. Mus., vol. 34, 1908, p. 162.—Chapman, Journ. Linn. Soc. Zool., vol. 30, 1910, p. 422.—Schubert, Abhandl. k. k. geol. Reichs., vol. 20, pt. 4, 1911, p. 111.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 5, 1915, p. 55; Bull. 100, vol. 4, 1921, p. 335, pl. 66, figs. 2 *a–c*.

Variety differing from the typical in the smaller size and the spinose character of the peripheral keel.

There are all gradations between the heavily spinose typical specimens of the variety and the smoother form. Figures are given here copied from the type figures of Brady.

Globorotalia menardii, var. *fimbriata*—*Material examined*

Cat. No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
			Albatross	° ′ ″ ° ′ ″				
21043	U.S.N.M.	5	D2117	15 24 20 N.; 63 31 30 W	683	39.8	yl. m., fne. s	Abundant.
21044	U.S.N.M.	10+	D2138	17 44 05 N.; 75 39 00 W	23	------	co. brk. sh	Do.
21045	U.S.N.M.	4	D2140	17 36 10 N.; 76 46 05 W	966	39.7	s	Few.
21849	U.S.N.M.	1	D2262	39 54 45 N.; 69 29 45 W	250	41.6	gn. m. s	Rare.
21046	U.S.N.M.	2	D2381	28 05 00 N.; 87 56 15 W	1330	------	lt. br. m	Do.
21047	U.S.N.M.	1	D2382	28 19 45 N.; 88 01 30 W	1255	39.6	gy. m	Do.
21048	U.S.N.M.	1	D2392	28 47 30 N.; 87 27 00 W	724	40.7	br. gy. m	Do.
21049	U.S.N.M.	2	D2394	28 38 30 N.; 87 02 00 W	420	41.8	gn. m	Do.
21050	U.S.N.M.	2	D2395	28 36 15 N.; 86 50 00 W	347	44.1	gy. m	Do.
21850	U.S.N.M.	1	D2398	28 45 00 N.; 86 26 00 W	227	48.6	gy. m	Do.
21930	U.S.N.M.	10+	D2760	12 07 00 S.; 37 17 00 W	1019	39.5	br. co	Abundant.
13027	J.A.C.	1	----------	Off Ragged Key, Fla	75	------	--------------	Rare.
21851	U.S.N.M.	1	----------	Off Fowey, Fla	40	------	--------------	Do.
21852	U.S.N.M.	2	----------	do	70	------	--------------	Do.

GLOBOROTALIA TUMIDA (H. B. Brady)

Plate 17, figures 3 *a–c*

Pulvinulina menardii d'Orbigny, var. *tumida* H. B. Brady, Geol. Mag., vol. 4, 1877, p. 294; Quart. Journ. Micr. Sci., vol. 19, 1879, p. 80.—Bagg, Proc. U. S. Nat. Mus., vol. 34, 1908, p. 163.

Pulvinulina tumida H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 692, pl. 103, figs. 4–6; Trans. Zool. Soc., vol. 12, 1888, p. 229.—Egger, Abhandl. kön. bay. Akad. Wiss. München, Cl. II, vol. 18, 1893, p. 414, pl. 17, figs. 4–6, 35–37, 44.—Woodward, The Observer, vol. 4, 1893, p. 178.—Chapman, Proc. Zool. Soc. London, 1895, p. 42.—Flint, Rept. U. S. Nat. Mus., 1897 (1899), p. 329, pl. 73, fig. 5.—Chapman, Journ. Linn. Soc. Zool., vol. 28, 1902, p. 406.—Millett, Journ. Roy. Micr. Soc., 1904, p. 499.—Cushman, Proc. Boston Soc. Nat. Hist., vol. 34, 1908, p. 31.—Chapman, Journ. Linn. Soc., Zoology, vol. 30, 1910, p. 422.—Heron-Allen and Earland, Journ. Roy. Micr. Soc., 1911, p. 341.—Schubert, Abhandl. k. k. geol. Reichs., vol. 20, pt. 4, 1911, p. 111, pl. 1, fig. 1 T; pl. 5, fig. 1 T; pl. 5, fig. 4 P.—Heron-Allen and Earland, Trans. Zool. Soc. London, vol. 20, 1915, p. 715.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 5, 1915, p. 56, pl. 22, fig. 3.—Sidebottom, Journ. Roy. Micr. Soc., 1918, p. 259.—Cushman, Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 337, pl. 66, figs. 3 *a–c*.—Heron-Allen and Earland, British Antarctic Exped., Zoology, vol. 6, 1922, p. 215.—Koch, Ber. Schweiz. Pal. Ges., vol. 18, 1923, p. 357.—Hanzawa, Jap. Journ. Geol. Pal., vol. 4, 1925 (1926), p. 44.—Yabe and Hanzawa, Jap. Journ. Geol. Pal., vol. 4, 1925 (1926), p. 52.

Test biconvex, oval, dorsal surface convex especially in the early portion, ventral side less convex, umbilicate; peripheral margin rounded, becoming more acute in the later formed portion with a rounded carina; chambers fairly numerous, about six in the last-formed whorl; sutures curved, depressed on the ventral side; wall of the early portion of the test granular, later chambers becoming progressively smoother; aperture an arched opening near the umbilical end of the margin of the chamber, often with a slight valvular projection above.

Diameter up to 1.25 mm.

This species is common and often abundant in the *Globigerina*-ooze deposits of the western Atlantic as elsewhere.

Globorotalia tumida—Material examined

Catalogue No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
			Albatross	° ′ ″ ° ′ ″				
21058	U.S.N.M.	10+	D2018	37 12 22 N.; 74 20 04 W	788	39	bu. m	Abundant.
21059	U.S.N.M.	6	D2034	39 27 10 N.; 69 56 20 W	1,346	38	glob. oz	Few.
21060	U.S.N.M.	10+	D2037	38 53 00 N.; 69 23 30 W	1,731	38	glob. oz	Abundant.
21061	U.S.N.M.	10	D2038	38 30 30 N.; 69 08 25 W	2,033		glob. oz	Common.
21062	U.S.N.M.	10+	D2039	38 19 26 N.; 68 20 20 W	2,369		glob. oz	Abundant.
21865	U.S.N.M.	10+						
21063	U.S.N.M.	10+	D2041	39 22 50 N.; 68 25 00 W	1,608	38	glob. oz	Do.
21064	U.S.N.M.	10+	D2042	39 33 00 N.; 68 24 45 W	1,555	38.5	glob. oz	Do.
21065	U.S.N.M.	10	D2052	39 40 05 N.; 69 21 25 W	1,098	45	glob. oz	Common.
21066	U.S.N.M.	10	D2097	37 56 20 N.; 70 57 30 W	1,917		glob. oz	Do.
21067	U.S.N.M.	10+	D2099	37 12 20 N.; 69 39 00 W	2,949		glob. oz	Abundant.
21068	U.S.N.M.	8	D2105	37 50 00 N.; 73 03 50 W	1,395	41	glob. oz	Common.
21069	U.S.N.M.	8	D2106	37 41 20 N.; 73 03 20 W	1,497	42.5	glob. oz	Do.
21070	U.S.N.M.	10+	D2117	15 24 20 N.; 63 31 30 W	683	39.8	yl. m., fne.s.	Abundant.
21071	U.S.N.M.	10+	D2138	17 44 05 N.; 75 39 00 W	23		co. brk. sh	Do.
21073	U.S.N.M.	10	D2140	17 36 10 N.; 76 46 05 W	966	39.7	s.	Common.
21072	U.S.N.M.	10+	D2144	9 49 00 N.; 79 31 30 W	896		gn. m	Abundant.
21074	U.S.N.M.	10+	D2150	13 34 45 N.; 81 21 10 W	382	45.8	wh. crs. s	Do.
21076	U.S.N.M.	6	D2189	39 49 30 N.; 70 26 00 W	600	39.7	gn. m., s	Few.
21075	U.S.N.M.	6	D2192	39 46 30 N.; 70 14 45 W	1,060	38.6	gy. oz	Do.
21077	U.S.N.M.	10+	D2208	39 33 00 N.; 71 16 15 W	1,178	38.4	gn. m	Abundant.
21078	U.S.N.M.	10+	D2224	36 16 30 N.; 68 21 00 W	2,574	36.8	glob. oz	Do.
21079	U.S.N.M.	9	D2225	36 05 30 N.; 69 51 45 W	2,512	36.7	yl. oz	Common.
21080	U.S.N.M.	10+	D2226	37 00 00 N.; 71 54 00 W	2,045	36.8	glob. oz	Abundant.
21081	U.S.N.M.	2	D2234	39 09 00 N.; 72 03 15 W	810	38.6	gn. m	Rare.
21082	U.S.N.M.	5	D2312	32 54 00 N.; 77 53 30 W	88	57.8	crs.s.,bk.sp.	Few.
21083	U.S.N.M.	5	D2313	32 53 00 N.; 77 53 00 W	99	57.2	crs.s.,bk.sp.	Do.
21084	U.S.N.M.	10	D2335	23 10 39 N.; 82 20 21 W	204			Common.
21085	U.S.N.M.	10+	D2352	22 35 00 N.; 84 23 00 W	463	45	wh. co	Abundant.
21086	U.S.N.M.	9						
21087	U.S.N.M.	10+	D2381	28 05 00 N.; 87 56 15 W	1,330		lt. br. m	Do.
21088	U.S.N.M.	10+	D2382	28 19 45 N.; 88 01 30 W	1,255	39.6	gn. m	Do.
21089	U.S.N.M.	10+	D2392	28 47 30 N.; 87 27 00 W	724	40.7	br. gy. m	Do.
21090	U.S.N.M.	10+	D2393	28 43 00 N.; 87 14 30 W	525	41.1	lt. gy. m	Do.
21091	U.S.N.M.	10+	D2394	28 38 30 N.; 87 02 00 W	420	418	gn. m	Do.
21092	U.S.N.M.	10+	D2395	28 36 15 N.; 86 50 00 W	347	44.1	gy. m	Do.
21093	U.S.N.M.	10	D2398	28 45 00 N.; 86 26 00 W	227	48.6	gy. m	Common.
21094	U.S.N.M.	10+	D2399	28 44 00 N.; 86 18 00 W	196	51.6	gy. m	Abundant.
21095	U.S.N.M.	10+	D2400	28 41 00 N.; 86 07 00 W	169		gy. m	Do.
21096	U.S.N.M.	10+	D2416	31 26 00 N.; 79 07 00 W	276	53.8	co., brk. sh	Do.
21097	U.S.N.M.	10+	D2542	40 00 15 N.; 70 42 20 W	129	47.2	s. brk. sh	Do.
21098	U.S.N.M.	2	D2550	39 44 30 N.; 70 30 45 W	1,081	38.5	br. m	Rare.
21099	U.S.N.M.	4	D2562	39 15 30 N.; 71 25 00 W	1,434	37.3	gy. oz	Few.
21055	U.S.N.M.	10+	D2563	39 18 30 N.; 71 23 30 W	1,422	37.4	gy. oz	Abundant.
21056	U.S.N.M.	4	D2564	39 22 00 N.; 71 23 30 W	1,390	37.3	gy. oz	Few.
21100	U.S.N.M.	10+	D2568	39 15 00 N.; 68 08 00 W	1,781	36.9	gy. oz	Abundant.
21101	U.S.N.M.	10+	D2573	40 34 18 N.; 66 09 00 W	1,742	37.3	gy. m. s	Do.
21052	U.S.N.M.	5						
21054	U.S.N.M.	4	D2585	39 08 30 N.; 72 77 00 W	542	39	dk. gy. m	Few.
21053	U.S.N.M.	4	D2586	39 02 40 N.; 72 40 00 W	328	40.2	dk. gy. m	Do.
21051	U.S.N.M.	3	D2614	34 09 00 N.; 76 02 00 W	168		gy. s., bk. sp.	Rare.
21102	U.S.N.M.	3	D2641	25 11 30 N.; 80 10 00 W	60	69.2	co. s	Do.
21103	U.S.N.M.	7	D2644	25 40 00 N.; 80 00 00 W	193	43.4	gy. s	Common.
21104	U.S.N.M.	10+	D2659	28 32 00 N.; 78 42 00 W	509	45.2	br. for	Abundant
21105	U.S.N.M.	3	D2660	28 40 00 N.; 78 46 00 W	504	45.7	yl. for	Rare.
21106	U.S.N.M.	10+	D2677	32 39 00 N.; 76 50 30 W	478	39.3	gn. m	Abundant.
21107	U.S.N.M.	10+	D2668	30 58 30 N.; 79 38 30 W	294	46.3	gy. s.,dd. co.	Do.
21108	U.S.N.M.	10+	D2678	32 40 00 N.; 76 40 30 W	731	38.7	lt. gy. oz	Do.
21109	U.S.N.M.	10+	D2679	32 40 00 N.; 76 40 30 W	782	38.6	lt. gy. oz	Do.
21110	U.S.N.M.	1	D2706	41 28 30 N.; 65 35 30 W	1,188		gy. oz., for	Rare.
21111	U.S.N.M.	1	D2713	38 20 00 N.; 70 08 30 W	1,859		br. oz	Do.
21112	U.S.N.M.	3	D2715	38 29 30 N.; 70 57 00 W	1,631		br. oz., for	Do.
21113	U.S.N.M.	10+	D2751	16 54 00 N.; 63 12 00 W	687	40	bu. glob. oz.	Abundant.
21114	U.S.N.M.	3	D2754	11 40 00 N.; 58 33 00 W	880	38	glob oz	Rare.
21115	U.S.N.M.	6	D2756	3 22 00 S.; 37 49 00 W	417	40.5	gy. sp	Few.
21116	U.S.N.M.	1	D2760	12 07 00 S.; 37 17 00 W	1,019	39.5	br. co	Rare.
21117	U.S.N.M.	4	D2761	15 39 00 S.; 38 32 54 W	818	39	pter. oz	Few.
21057	U.S.N.M.	5	D2763	24 17 00 S.; 42 48 30 W	671	37.9	br. glob. oz	Do.
21866	U.S.N.M.	1		Off Ragged Reef, Fla	75			Rare.
13035	J.A.C.	1		Off Sound Key, Fla	72			Do.
21867	U.S.N.M.	1		Off Fowey, Fla	45			Do.
21868	U.S.N.M.	10+	*Goldseeker*	Off S. W. Ireland	620–695			Abundant.
21869	U.S.N.M.	1						

GLOBOROTALIA TRUNCATULINOIDES (d'Orbigny)

Plate 17, figures 4 *a–c*

Rotalina truncatulinoides D'ORBIGNY, in Barker-Webb and Berthelot, Hist. Nat. Iles Canaries, vol. 2, pt. 2, "Foraminifères," 1839, p. 132, pl. 2, figs. 25–27.

Pulvinulina truncatulinoides PARKER and JONES, Philos. Trans., vol. 155, 1865, p. 398, pl. 16, figs. 41–43.—RHUMBLER, in Brandt, Nordische Plankton, Heft. 14, 1900, p. 17, fig. 16.—CHAPMAN, Trans. New Zealand Instit., vol. 38, 1905, p. 105; Subantarctic Islands of New Zealand, 1909, p. 361; Journ. Linn. Soc., Zoology, vol. 30, 1910, p. 423; Zool. Res. *Endeavour*, pt. 3, 1912, p. 311.—HERON-ALLEN and EARLAND, Proc. Roy. Irish Acad., vol. 31, pt. 64, 1913, p. 138.—PEARCEY, Trans. Roy. Soc. Edinburgh, vol. 49, 1914, p. 1029.—CUSHMAN, Bull. 71, U. S. Nat. Mus., pt. 5, 1915, p. 59, pl. 23, fig. 4.—CHAPMAN, Biol. Res. *Endeavour*, vol. 3, pt. 1, 1915, p. 32.—HERON-ALLEN and EARLAND, Trans. Zool. Soc. London, vol. 20, 1915, p. 716.—SIDEBOTTOM, Journ. Roy. Micr. Soc., 1918, p. 259.—CUSHMAN, Proc. U. S. Nat. Mus., vol. 56, 1919, p. 630; Bull. 100, vol. 4, 1921, p. 339, pl. 67, figs. 2*a–c*.—HERON-ALLEN and EARLAND, British Antarctic Exped., Zoology, vol. 6, 1922, p. 216; Journ. Linn. Soc. Zool., vol. 35, 1924, p. 636; Journ. Roy. Micr. Soc., 1924, p. 180.—HANZAWA, Jap. Journ. Geol. Pal., vol. 4, 1925 (1926), p. 44.—YABE and HANZAWA, Jap. Journ. Geol. Pal., vol. 4, 1925 (1926), p. 52.—CASASNOVAS, Not. Y Res. Instit. Esp. Ocean., ser. 2, No. 29, 1928, p. 8.

Globorotalia truncatulinoides CUSHMAN, Bull. Scripps Instit. Oceanography, Tech. Ser., vol. 1, 1927, p. 176.—CUSHMAN and WICKENDEN, Proc. U. S. Nat. Mus., vol. 7, art. 9, 1929, p. 14, pl. 6, figs. 3 *a–c*.

Pulvinulina repanda, var. *menardii*, subvar. *micheliniana* PARKER and JONES, Philos. Trans., vol. 155, 1865, p. 396, pl. 14, fig. 16; pl. 16, figs. 41–43 (not *Rotalina micheliniana* d'Orbigny).

Pulvinulina micheliniana OWEN, Journ. Linn. Soc. Zool., vol. 9, 1867, p. 148, pl. 5, fig. 17.—GOËS, Kongl. Svensk. Vet. Akad. Handl., vol. 19, pt. 4, 1882, p. 114, pl. 8, figs. 296–298.—H. B. BRADY, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 694, pl. 104, figs. 1, 2; Quart. Journ. Geol. Soc., vol. 44, 1888, p. 10.—H. B. BRADY, PARKER, and JONES, Trans. Zool. Soc., vol. 12, 1888, p. 229, pl. 46, figs. 9, 10.—WRIGHT, Proc. Roy. Irish Acad., ser. 3, vol. 1, 1891, p. 491.—EGGER, Abhandl. kön. bay. Akad. Wiss. München, Cl. II, vol. 18, 1893, p. 416, pl. 18, figs. 1–6.—WOODWARD, The Observer, vol. 4, 1893, p. 177.—SILVESTRI, Mem. Accad. Pont. Nuovi Lincei, vol. 9, 1893, p. 214.—CHAPMAN, Proc. Zool. Soc. London, 1895, p. 42.—GOËS, Bull. Mus. Comp. Zoöl., vol. 29, 1896, p. 75.—FLINT, Ann. Rep't. U. S. Nat. Mus., 1897 (1899), p. 330, pl. 74, fig. 2.—MILLETT, Journ. Roy. Micr. Soc., 1904, p. 500.—BAGG, Proc. U. S. Nat. Mus., vol. 34, 1908, p. 162.—SIDEBOTTOM, Mem. Proc. Manchester Lit. Philos. Soc., vol. 54, No. 16, 1910, p. 28.—SCHUBERT, Abhandl. k. k. geol. Reichsanst., vol. 20, pt. 4, 1911, p. 111.—HERON-ALLEN and EARLAND, Bull. Soc. Sci. Hist. Nat. Corse, 1922, p. 137.—KOCH, Ber. Schweiz. Pal. Ges., vol. 18, 1923, p. 357.

Test subconical, the dorsal surface either flat or more often slightly concave, ventral surface forming a truncate cone, umbilicate; peripheral margin angular, bluntly rounded, often slightly carinate; chambers comparatively few, five or six in the last-formed whorl, sutures nearly radial; dorsal surface nearly smooth, punctate or slightly granular, ventral surface very often decidedly granular; aperture a long narrow opening extending from the umbilicus nearly to the peripheral margin.

Diameter, 0.60–1.00 mm.

This is a very widely distributed species in *Globigerina*-ooze in all the oceans. It occurs in fossilized *Globigerina*-oozes of the Late Tertiary, but is not identical with d'Orbigny's species from the Chalk of the Paris Basin.

Globorotalia truncatulinoides—Material examined

Catalogue No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
			Albatross	° ′ ″ ° ′ ″				
21118	U.S.N.M.	3	D2018	37 12 22 N.; 74 20 04 W	788	39	bu. m	Rare.
21119	U.S.N.M.	7	D2034	39 27 10 N.; 69 56 20 W	1,346	38	glob. oz	Common.
21120	U.S.N.M.	1	D2035	39 26 16 N.; 70 02 37 W	1,362	------	glob. oz	Rare.
21121	U.S.N.M.	3	D2037	38 53 00 N.; 69 23 30 W	1,731	38	glob. oz	Do.
21122	U.S.N.M.	5	D2038	38 30 30 N.; 69 08 25 W	2,033	------	glob. oz	Few.
21123	U.S.N.M.	6	D2039	38 19 26 N.; 68 20 20 W	2,369	------	glob. oz	Do.
21124	U.S.N.M.	8	D2041	39 22 50 N.; 68 25 00 W	1,608	38	glob. oz	Common.
21125	U.S.N.M.	3	D2042	39 33 00 N.; 68 26 45 W	1,555	38.5	glob. oz	Few.
21126	U.S.N.M.	2						
21127	U.S.N.M.	4	D2052	39 40 05 N.; 69 21 25 W	1,098	45	glob. oz	Do.
21128	U.S.N.M.	1						
21129	U.S.N.M.	10+	D2097	37 56 20 N.; 70 57 30 W	1,917	------	glob. oz	Abundant.
21130	U.S.N.M.	10+	D2099	37 12 20 N.; 69 39 00 W	2,949	------	glob. oz	Do.
21131	U.S.N.M.	4	D2105	37 50 00 N.; 73 03 50 W	1,395	41	glob. oz	Few.
21132	U.S.N.M.	2	D2106	37 41 20 N.; 73 03 20 W	1,497	42.5	glob. oz	Rare.
21133	U.S.N.M.	1	D2112	35 20 50 N.; 75 18 00 W	16	73.5	s. blk. sp	Do.
21134	U.S.N.M.	10+	D2117	15 24 20 N.; 63 31 30 W	683	39.8	yl. m. fne. s.	Abundant.
21135	U.S.N.M.	7	D2138	17 44 05 N.; 75 39 00 W	23	------	co., brk. sh	Common.
21136	U.S.N.M.	5	D2140	17 36 10 N.; 76 46 05 W	966	39.7	s	Few.
21137	U.S.N.M.	6	D2144	9 49 00 N.; 79 31 30 W	896	------	gn. m	Do.
21138	U.S.N.M.	5	D2150	13 34 45 N.; 81 21 10 W	382	45.8	wh. crs. s	Do.
21870	U.S.N.M.	1	------	------	------	------	------	
21139	U.S.N.M.	4	D2189	39 49 30 N.; 70 26 00 W	600	39.7	gn. m., s	Do.
21140	U.S.N.M.	5	D2192	39 46 30 N.; 70 14 45 W	1,060	38.6	gy. oz	Do.
21141	U.S.N.M.	6	D2208	39 33 00 N.; 71 16 15 W	1,178	38.4	gn. m	Do.
21142	U.S.N.M.	2	D2217	39 47 20 N.; 69 34 15 W	924	38.1	gy. m	Rare.
21143	U.S.N.M.	10+	D2224	36 16 30 N.; 68 21 00 W	2,574	36.8	glob. oz	Abundant.
21144	U.S.N.M.	10+	D2225	36 05 30 N.; 69 51 45 W	2,512	36.7	yl. oz	Do.
21145	U.S.N.M.	10+	D2226	37 00 00 N.; 71 54 00 W	2,045	36.8	glob. oz	Do.
21146	U.S.N.M.	1	D2234	39 09 00 N.; 72 03 15 W	810	38.6	gn. m	Rare.
21147	U.S.N.M.	1	D2312	32 54 00 N.; 77 53 30 W	88	57.8	crs. s., bk. sp.	Do.
21148	U.S.N.M.	6	D2313	32 53 00 N.; 77 53 00 W	99	57.2	crs. s., bk. sp.	Few.
21149	U.S.N.M.	9	D2335	23 10 39 N.; 82 20 21 W	204	------	------	Common.
21150	U.S.N.M.	1	D2352	22 35 00 N.; 84 23 00 W	463	45	wh. co	Abundant.
21151	U.S.N.M.	10						
21152	U.S.N.M.	5	D2355	20 56 48 N.; 86 27 00 W	399	------	yl. oz	Few.
21871	U.S.N.M.	10+	D2377	29 07 30 N.; 88 08 00 W	210	67	gy. m	Abundant.
21153	U.S.N.M.	10+	D2381	28 05 00 N.; 87 56 15 W	1,330	------	lt. br. m	Do.
21154	U.S.N.M.	10+	D2382	28 19 45 N.; 88 01 30 W	1,255	39.6	gy. m	Do.
21155	U.S.N.M.	10+	D2392	28 47 30 N.; 87 27 00 W	724	40.7	br. gy. m	Do.
21156	U.S.N.M.	10+	D2393	28 43 00 N.; 87 14 30 W	525	41.1	lt. gy. m	Do.
21157	U.S.N.M.	10+	D2394	28 38 30 N.; 87 02 00 W	420	41.8	gn. m	Do.
21158	U.S.N.M.	10+	D2395	28 36 15 N.; 86 50 00 W	347	44.1	gy. m	Do.
21159	U.S.N.M.	10+	D2398	28 45 00 N.; 86 26 00 W	227	48.6	gy. m	Do.
21160	U.S.N.M.	10+	D2399	28 44 00 N.; 86 18 00 W	196	51.6	gy. m	Do.
21161	U.S.N.M.	10+	D2400	28 41 00 N.; 86 07 00 W	169	------	gy. m	Do.
21162	U.S.N.M.	10+	D2416	31 26 00 N.; 79 07 00 W	276	53.8	co., brk. sh	Do.
21163	U.S.N.M.	10+	D2542	40 00 15 N.; 70 42 20 W	129	47.2	s., brk. sh	Abundant.
21164	U.S.N.M.	1	D2550	39 44 30 N ; 70 30 45 W	1,081	38.5	br. m	Rare.
21165	U.S.N.M.	4	D2562	39 15 30 N.; 71 25 00 W	1,434	37.3	gy. oz	Few.
21166	U.S.N.M.	5	D2563	39 18 30 N.; 71 23 30 W	1,422	37.4	gy. oz	Do.
21167	U.S.N.M.	3	D2564	39 22 00 N.; 71 23 30 W	1,390	37.3	gy. oz	Rare.
21168	U.S.N.M.	10+	D2568	39 15 00 N.; 68 08 00 W	1,781	36.9	gy. oz	Abundant.
21169	U.S.N.M.	8	D2573	40 34 18 N.; 66 09 00 W	1,742	37.3	gy. m. s	Common.
21170	U.S.N.M.	2						
21171	U.S.N.M.	7	D2585	39 08 30 N.; 72 17 00 W	542	39	dk. gy. m	Do.
21172	U.S.N.M.	2	D2586	39 02 40 N.; 72 40 00 W	328	40.2	dk. gy. m	Rare.

Globorotalia truncatulinoides—Material examined—Continued

Catalogue No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
			Albatross	° ′ ″ ° ′ ″				
21173	U.S.N.M.	7	D2614	34 09 00 N.; 76 02 00 W	168	------	gy. s. bk. sp.	Few.
21174	U.S.N.M.	10+	D2629	23 48 40 N.; 75 10 40 W	1,169	38.4	co. s.	Abundant.
21175	U.S.N.M.	1	D2639	25 04 50 N.; 80 15 10 W	56	------	co. s.	Rare.
21176	U.S.N.M.	9	D2641	25 11 30 N.; 80 10 00 W	60	69.2	co. s.	Common.
21177	U.S.N.M.	1	D2644	25 40 00 N.; 80 00 00 W	193	43.4	gy. s.	Rare.
21178	U.S.N.M.	10+	D2659	28 32 00 N.; 78 42 00 W	509	45.2	br. for.	Abundant.
21179	U.S.N.M.	10	D2660	28 40 00 N.; 78 46 00 W	504	45.7	yl. for.	Common.
21180	U.S.N.M.	10+	D2668	30 58 30 N.; 79 38 30 W	294	46.3	gy. s., dd. co.	Abundant.
21181	U.S.N.M.	10+	D2677	32 39 00 N.; 76 56 30 W	478	39.3	gn. m.	Do.
21182	U.S.N.M.	10	D2678	32 40 00 N.; 76 40 30 W	731	38.7	lt. gy. oz.	Common.
21183	U.S.N.M.	10	D2679	32 40 00 N.; 76 40 30 W	782	38.6	lt. gy. oz.	Do.
21184	U.S.N.M.	2	D2714	38 22 00 N.; 70 17 30 W	1,825	------	lr. oz.	Rare.
21185	U.S.N.M.	3	D2716	38 29 30 N.; 70 57 00 W	1,509	------	gy. oz.	Do.
21186	U.S.N.M.	2	D2748	39 31 00 N.; 71 14 30 W	1,163	37.8	gy. m., for.	Do.
21187	U.S.N.M.	2	D2754	11 40 00 N.; 58 33 00 W	880	38	glob. oz.	Do.
21188	U.S.N.M.	8	D2751	16 54 00 N.; 63 12 00 W	687	40	bu. glob. oz.	Common.
21189	U.S.N.M.	1	D2756	3 22 00 S.; 37 49 00 W	417	40.5	gy. sp.	Rare.
21190	U.S.N.M.	10	D2763	24 17 00 S.; 42 48 30 W	671	37.9	br. glob. oz.	Common.
13038	J.A.C.	3	------	Off Ragged Key, Fla.	71	------	------	Rare.
21872	U.S.N.M.	3	------	do.	85	------	------	Do.
13039	J.A.C.	1	------	Off Sand Key, Fla.	72	------	------	Do.
21873	U.S.N.M.	5	------	Off Ajax Reef, Fla.	40	------	------	Few.
21874	U.S.N.M.	1	------	Off Fowey, Fla.	45	------	------	Rare.
21875	U.S.N.M.	3	------	do.	70	------	------	Do.
21876	U.S.N.M.	2	------	Off Key West, Fla.	78	------	------	Do.
13040	J.A.C.	10+	*Flying Fox.*	W. of Ireland	1,000	------	------	Abundant.
21877	U.S.N.M.	1	*Goldseeker*	59 41 00 N.: 8 00 00 W	------	------	------	Rare.
21878	U.S.N.M.	6	do.	Off S. W. Ireland	620–695	------	------	Few.
21879	U.S.N.M.	1	do.	60 28 00 N.; 3 15 00 W	------	------	------	Rare.

GLOBOROTALIA HIRSUTA (d'Orbigny)

Plate 17, figures 6 *a–c*

Rotalina hirsuta d'Orbigny, in Barker-Webb and Berthelot, Hist. Nat. Iles Canaries, vol. 2, pt. 2, "Foraminifères," 1839, p. 131, pl. 1, figs. 37–39.

Test trochoid, biconvex, the spire distinct in the middle but the last-formed whorl much compressed, periphery lobulated, not carinate; chambers usually only four in the last-formed whorl, elongate, greatly increasing in size, the last-formed one in the adult making up half the test on the ventral side; sutures depressed, not limbate, strongly curved on the dorsal side, nearly radial ventrally; wall roughened with minute papillae; aperture ventral, a low arch on the border of the chamber.

Diameter up to 0.85 mm.

This species has been entirely neglected. It was described by d'Orbigny from the Canaries. *Rotalina canariensis* of the same report was taken up by other authors, and the form belonging to *G. hirsuta* was assigned to *G. canariensis* by Brady and well figured in the *Challenger* Report (pl. 105, figs. 8, 9). From the original figure of *Rotalina canariensis* d'Orbigny, it is close to if not identical with *Globorotalia menardii*, although d'Orbigny speaks of it as distinctly yellow in color. Certainly it is not the form usually assigned to *Pulvinulina canariensis* by later authors, and which should be known as *Globorotalia hirsuta* (d'Orbigny). The peculiar placing of the chambers with the median line radial instead of oblique, very lobulated periphery, depressed, nonlimbate sutures and finely papillate surface, with typically only four chambers in the final whorl, will distinguish this species.

Its Atlantic distribution so far as the material examined shows is a very definite one, from the coast of Carolina to the British Isles. It is very abundant at a few *Albatross* stations, but is wanting at the others.

The many records for "*Pulvinulina canariensis*" should be checked with the original material before being accepted.

Globorotalia hirsuta—Material examined

Catalogue No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
			Albatross	° ′ ″ ° ′ ″				
21853	U.S.N.M.	1	D2224	36 16 30 N.; 68 21 00 W	2574	36.8	glob. oz	Abundant.
21854	U.S.N.M.	10+						
21855	U.S.N.M.	9	D2225	36 05 30 N.; 69 51 45 W	2512	36.7	yl. oz	Common.
21856	U.S.N.M.	1						
21857	U.S.N.M.	4	D2226	37 00 00 N.; 71 54 00 W	2045	36.8	glob. oz	Few.
21858	U.S.N.M.	1	D2568	39 15 00 N.; 68 08 00 W	1781	36.9	gy. oz	Rare.
21859	U.S.N.M.	1	D2677	32 39 00 N.; 76 50 30 W	478	39.3	gn. m	Do.
21860	U.S.N.M.	1	D2713	38 20 00 N.; 70 08 30 W	1859		br. oz	Do.
21861	U.S.N.M.	1	D2716	38 29 30 N.; 70 57 00 W	1631		br. oz. for	Do.
21862	U.S.N.M.	4	D2763	24 17 00 S.; 42 48 30 W	671	37.9	br. glob. oz	Few.
21863	U.S.N.M.	1		Off Fowey, Fla	70			Rare.
13029	J.A.C.	4	*Goldseeker* Haul. 223	57 59 00 N.; 10 34 00 W				Few.
21864	U.S.N.M.	3	*Goldseeker*	59 41 00 N.; 8 00 00 W				Rare.
13030	J.A.C.	4	*Flying Fox.*	W. of Ireland	1000			Few.

GLOBOROTALIA SCITULA (H. B. Brady)

Plate 17, figures 5 *a–c*

Pulvinulina scitula H. B. Brady, Proc. Roy. Soc. Edinburgh, vol. 11, 1882, p. 716.—Heron-Allen and Earland, Journ. Roy. Micr. Soc., 1915, p. 51, pl. 9, figs. 2–5; 1930, p. 190.

Pulvinulina patagonica H. B. Brady (not *Rotalia patagonica* d'Orbigny), Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 693, pl. 103, figs. 7 *a–c* (and later authors).

Globorotalia scitula Cushman, Bull. Scripps Instit. Oceanography, Tech. Ser., vol. 1, No. 10, 1927, p. 175.

Test small, strongly biconvex, periphery rounded; chambers oblique, distinct, gradually and uniformly increasing in size as added, usually 6 or 7 in the last-formed whorl; sutures depressed, not limbate, very strongly curved dorsally, slightly curved but nearly radial ventrally; wall smooth and polished, very white; aperture, an elongate opening ventrally, with a slight lip.

Diameter usually not over 0.25 mm.

This is different from d'Orbigny's *Rotalina patagonica* which is an *Eponides* as a study of collections from the coast of South America has shown.

So far as the Atlantic material studied is concerned, the species seems to be very rare. Brady's original material was from the Faroe Channel, and our specimens are from the same general region.

Globorotalia scitula—Material examined

Cat. No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
13031	J.A.C.	9	*Flying Fox.*	W. of Ireland	1,000	------	-------------	Common.
13032	J.A.C.	1						
13033	J.A.C.	2	*Goldseeker* Haul 223.	57° 59′ 00″ N.; 10° 34′ 00″ W.	-------	------	-------------	Rare.

Genus CYCLOLOCULINA Heron-Allen and Earland, 1908

Cycloloculina HERON-ALLEN and EARLAND, Journ. Roy. Micr. Soc., 1908, p. 533.—CUSHMAN, Special Publ. No. 1, Cushman Lab. Foram. Res., 1928, p. 314.

Genotype, by designation.—*Cycloloculina annulata* Heron-Allen and Earland.

Test with the early chambers in a low trochoid spire, the chambers globular, then becoming elongate, the periphery somewhat spinose, with short conical spines, later chambers still more elongate finally becoming annular; wall calcareous, coarsely perforate; no general aperture, the large coarse perforations serving as apertures.

Eocene.

Genus SHERBORNINA Chapman, 1922

Sherbornina CHAPMAN, Journ. Linn. Soc. Zool., vol. 34, 1922, p. 501.—CUSHMAN, Special Publ. No. 1, Cushman Lab. Foram. Res., 1928, p. 314.

Genoholotype.—*Sherbornina atkinsoni* Chapman.

"Test discoidal, moderately thin, median arch concave. Shell built up of a median annular series of chamberlets with a discorbine commencement; the loculi of the annuli widely spaced. External layer formed of small overlapping spatulate chamberlets. The primordial series of about 7 globular to reniform segments, lying in the median system, is discorbine—that is, depressed rotaline. Shell-wall perforated with coarse tubuli." (Chapman.)

Miocene. Tasmania.

Family 41. ANOMALINIDAE

Test free, or attached by the dorsal surface which is typically flattened or concave; chambers arranged in a trochoid manner, at least in the early stages, only those of the last-formed chamber visible from the ventral side; wall calcareous, coarsely perforate; aperture in the adult either at the periphery or with an extension on the dorsal side.

In this family which has been derived from the Rotaliidae, the aperture appears first in the median line with the bilateral test of *Anomalina*, then as the test becomes plano-convex and attached by the dorsal surface, the aperture swings over to the dorsal side. In *Cyclocibicides* and *Cibicidella*, genera of the Mediterranean especially, there is an added structure, annular in one and irregular with flask-shaped chambers in the other. *Webbina* is probably a degenerate genus belonging here. From this family came the attached forms placed in the families Homotremidae and Rupertiidae by the development at right angles to the area of the attachment.

KEY TO THE GENERA

- I. Test nearly symmetrical
  - A. Test more or less involute.
    - 1. Aperture usually median in the adult, at the base of the chamber ---------- **Anomalina**
    - 2. A supplementary aperture on the peripheral margin ---------- **Anomalinella**
  - B. Test little if at all involute, much compressed.
    - 1. Without a broad keel ---------- **Planulina**
    - 2. With a broad, thin keel ---------- **Laticarinina**
- II. Test strongly plano-convex.
  - A. Aperture narrow, along the periphery and inner dorsal edge of the chamber.
    - 1. Test close coiled throughout ---------- **Cibicides**
    - 2. Test becoming biserial ---------- **Dyocibicides**
  - B. Aperture with a neck and lip.
    - 1. Irregularly spreading ---------- **Cibicidella**
    - 2. Irregularly linear ---------- **Webbina**
  - C. Aperture of several small openings ---------- **Cyclocibicides**

Subfamily 1. ANOMALININAE

Test compressed, nearly symmetrical on the two sides in the adult; aperture peripheral.

Genus ANOMALINA d'Orbigny, 1826

Anomalina D'ORBIGNY, Ann. Sci. Nat., vol. 7, 1826, p. 282.—H. B. BRADY, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 671.—CHAPMAN, The Foraminifera, 1902, p. 220.—CUSHMAN, Special Publ. No. 1, Cushman Lab. Foram. Res., 1928, p. 315.

Aspidospira EHRENBERG, Bericht. k. preuss. Akad. Wiss. Berlin, 1844, p. 75 (genotype by designation, *Aspidospira saxipara* Ehrenberg).

Porospira EHRENBERG, Bericht. k. preuss. Akad. Wiss. Berlin, 1844, p. 75 (genotype by designation, *Porospira comes* Ehrenberg).
Rosalina (part) of AUTHORS.
Rotalia (part) of AUTHORS.
Discorbina (part) of AUTHORS.
Planorbulina (part) of AUTHORS.
Truncatulina (part) of AUTHORS.

Genotype, by designation.—*Anomalina punctulata* d'Orbigny.

Test in the young, trochoid, in the adult often nearly involute on the dorsal as well as on the ventral side, the chambers added nearly in a planispiral manner, the inner coils of the dorsal side often appearing as a central raised boss; wall calcareous, perforate; aperture in the young on the ventral side, in the adult becoming peripheral at the base of the last-formed chamber in the median line, sometimes with a boss of clear material over the umbilical region.

Lower Cretaceous to Recent.

The genus *Anomalina* is not as well characterized as some of the others of d'Orbigny. His original descriptions show that it is related to *Cibicides*, but may be used for those forms which are more nearly bilaterally symmetrical with the earlier chambers usually showing somewhat from either side, but the test not flattened and spread out as much as in *Planulina*.

ANOMALINA EDWARDSIANA (d'Orbigny)

Plate 19, figure 4

Rosalina edwardsiana D'ORBIGNY, in De la Sagra, Hist. Fis. Pol. Nat. Cuba, 1839, "Foraminiféres," p. 106, pl. 6, figs. 8–10.
Anomalina edwardsiana CUSHMAN, Publ. 311, Carnegie Instit., Washington, 1922, p. 50, pl. 8, figs. 1, 2.

Test unequally biconvex, the dorsal side flatter than the ventral, periphery slightly lobulated; chambers typically visible on both sides to the center, numerous, eight or nine in the last-formed coil, distinct; sutures distinct, those of the dorsal side more limbate and very slightly depressed, those of the ventral side less limbate but more depressed; wall coarsely perforate; aperture with an elongate, curved slit on the dorsal side of the last-formed chamber extending down the periphery, with a slight overhanging, thin lip.

Anomalina edwardsiana—Material examined

Catalogue No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
3000	J. A. C.	2	42	Dry Tortugas, Fla	18	------	s	Rare.

Diameter not usually exceeding 0.50 mm.

The types described by d'Orbigny came from shore sands of Cuba and Jamaica. It has been rare in the Tortugas collections occurring at several stations, but in few numbers.

ANOMALINA CORONATA Parker and Jones

Plate 18, figures 3, 4 (?)

Anomalina coronata Parker and Jones, Ann. Mag. Nat. Hist., ser. 2, vol. 19, 1857, p. 294, pl. 10, figs. 15, 16.—H. B. Brady, Trans. Linn. Soc. Zool., vol. 24, 1864, p. 469, pl. 48, figs. 13 *a*, *b*; Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 675, pl. 97, figs. 1, 2.—Woodward, The Observer, vol. 4, 1893, p. 177.—Fornasini, Mem. Accad. Sci. Istit. Bologna, ser. 5, vol. 3, 1893, pl. 2, fig. 17.—Morton, Proc. Portland Soc. Nat. Hist., vol. 2, 1897, p. 120, pl. 1, fig. 21.—Flint, Ann. Rep't. U. S. Nat. Mus., 1897 (1899), p. 335, pl. 79, fig. 2.—Kiaer, Rep't. Norwegian Fish. and Mar. Invest., vol. 1, No. 7, 1900, p. 46.—Chapman, Journ. Linn. Soc. Zool., vol. 28, 1902, p. 406.—Cushman, Amer. Geol., vol. 33, 1904, p. 266.—Bagg, Proc. U. S. Nat. Mus., vol. 34, 1908, p. 159.—Chapman, Subantarctic Islands of New Zealand, 1909, p. 360, pl. 17, fig. 10.—Heron-Allen and Earland, Journ. Roy. Micr. Soc., 1909, p. 682; 1911, p. 337.—Schubert, Abhandl. k. k. Geol. Reichsanst., vol. 20, pt. 4, 1911, p. 107.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 5, 1915, p. 47, pl. 18, fig. 5.—Chapman, Biol. Res. *Endeavour*, vol. 3, pt. 1, 1915, p. 31.—Sidebottom, Journ. Roy. Micr. Soc., 1918, p. 258.—Halkyard, Mem. Proc. Manchester Lit. Philos. Soc., vol. 62, pt. 2, 1918 (1919), p. 120.—Cushman, Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 326, pl. 61, figs. 2 *a–c*.—Heron-Allen and Earland, British Antarctic Exped., Zoology, vol. 6, 1922, p. 212.—Yabe and Hanzawa, Jap. Journ. Geol. Pal., vol. 4, 1925 (1926), p. 52.—Chapman, New Zealand Geol. Survey, Pal. Bull. No. 11. 1926, p. 80, pl. 16, fig. 4.—Cushman and Wickenden, Proc. U. S. Nat, Mus., vol. 75, art. 9, 1929, p. 14, pl. 6, figs. 9 *a–c*.

Planorbulina farcata, var. (*Anomalina*) *coronata* Parker and Jones, Philos. Trans., vol. 155, 1865, p. 383, pl. 14, figs. 7–11.

Planorbulina coronata Goës, Kongl. Svensk. Vet. Akad. Handl., vol. 25, No. 9, 1894, p. 90, pl. 15, figs. 781–783.

Test nautiloid, nearly equally biconvex, the dorsal side more convex than the ventral; the umbilical region concave on both sides, broad, in face view nearly as broad as the diameter; peripheral border nearly flattened in the later chambers which increase rapidly in width, about eight chambers in the final coil; wall coarsely perforate. The inner border of the chambers often of clear shell material; aperture a narrow curved slit at the ventral side of the chamber, oblique.

Diameter up to 1.5 mm.

This species was originally described from the North Atlantic. There are numerous records from other regions given in the list of references above, but it is difficult to be certain except from a study of the original material to determine whether or not they are really the same.

This is a highly developed species becoming very broad in its later chambers. The figures, (pl. 18, figs. 3*a–c*) copied from those of Brady in the *Challenger* Report, are from off Prince Edward Island. Brady gives the following Atlantic records: "ten 'Porcupine' stations in the North Atlantic, depths from 155 to 1,630 fathoms; four points on the coast of Norway, 30 to 160 fathoms (Parker and Jones); the Shetland Seas, 75 to 90 fathoms; off the Azores, 450 fathoms; and off the Canaries, 600 fathoms; in the South Atlantic, off Pernambuco, 350 fathoms; off Tristan d'Acunha, 100 to 150 fathoms; and north of the Falkland Islands, 1,035 fathoms."

The following variety may be distinguished:

Anomalina coronata—Material examined

Catalogue No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
21884	U.S.N.M.	3	*Albatross* D2262	39° 54′ 45″ N.; 69° 29′ 45″ W.	250	41.6	gn. m. s.	Rare.
21885	U.S.N.M.	1		Off Fowey, Fla.	100			Do.
21886	U.S.N.M.	2	*Goldseeker*	61° 34′ 00″ N.; 2° 4′ 00″ E.				Do.

ANOMALINA CORONATA Parker and Jones, var. CRASSA, new variety

Plate 19, figures 1, 2

Test very broad and thick, the umbilical areas covered with a secondary thickening of calcareous wall which is irregularly perforated by canals leading to the umbilical area.

Holotype of variety (Cat. No. 21887, U.S.N.M.) from *Albatross* Station D2063, off the eastern coast of the United States, in 141 fathoms.

At the type station this variety is very abundant. Even in the early stages the great thickening of the test is shown.

Anomalina coronata, var. crassa—Material examined

Catalogue No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
21887	U.S.N.M.	1	*Albatross* D2063	42° 23′ 00″ N.; 66° 23′ 00″ W.	141	46	s. crs. g.	Abundant.
21888	U.S.N.M.	1						
21889	U.S.N.M.	10+						
21890	U.S.N.M.	10+						
21891	U.S.N.M.	10+	*Goldseeker*	61° 34′ 00″ N.; 2° 4′ 00″ E.				Do.

ANOMALINA SEMIPUNCTATA (Bailey)

Plate 18, figures 1, 2

Rotalina semipunctata Bailey, Smithsonian Contrib., vol. 2, art. 3, 1851, p. 11, pl., figs. 17–19.

Anomalina polymorpha Costa, Atti dell' Accad. Pont., vol. 7, 1856, p. 252, pl. 21, figs. 7–9.—H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 676, pl. 97, figs. 3–7.—Howchin, Trans. Proc. Roy. Soc. So. Australia, vol. 12, 1889, p. 13.—Woodward, The Observer, vol. 4, 1893, p. 177.—Egger, Abhandl. kön. bay. Akad. Wiss. München, Cl. II, vol. 18, 1893, p. 380, pl. 14, figs. 27, 28, 32–34.—Amicis, Nat. Sicil., Ann. XIV, 1895, p. 119.—Chapman, Proc. Zool. Soc. London, 1895, p. 41.—Flint, Ann. Rep't. U. S. Nat. Mus., 1897 (1899), p. 336, pl. 79, fig. 3.—Chapman, Trans. New Zealand Instit., vol. 38, 1905 (1906), p. 104; Journ. Quekett Micr. Club, ser. 2, vol. 10, 1907, p. 138.—Bagg, Proc. U. S. Nat. Mus., vol. 34, 1908, p. 160.—Chapman, Journ. Linn. Soc. Zool., vol. 30, 1910, p. 421.—Schubert, Abhandl. k. k. geol. Reichsanst, vol. 20, pt. 4, 1911, p. 107, fig. 15 (in text).—Pearcey, Trans. Roy. Soc. Edinburgh, vol. 49, 1914, p. 1028.—Chapman, Biol. Res. *Endeavour*, vol. 3, pt. 1, 1915, p. 31.—Heron-Allen and Earland, Trans. Zool. Soc. London, vol. 20, 1915, p. 712, pl. 53, figs. 2–5.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 5, 1915, p. 47, pl. 19, figs. 3, 4.—Chapman, Rep't. British Antarctic Exped., Geol., vol. 2, 1916 (1917), p. 70.—Sidebottom, Journ. Roy. Micr. Soc., 1918, p. 258.—Cushman, Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 324, pl. 61, figs. 3*a*, *b*.—Heron-Allen and Earland, Rep't. British Antarctic Exped., Zool., vol. 6, 1922, p. 212.—Hanzawa, Jap. Journ. Geol. Pal., vol. 4, 1925 (1926), p. 43.—Yabe and Hanzawa, Jap. Journ. Geol. Pal., vol. 4, 1925 (1926), p. 52.—Koch, Ber. Schweiz. Pal. Ges., vol. 19, No. 3, 1926, p. 747.

Test nautiloid, nearly equally biconvex, ventral side concave, dorsal convex; umbilical region on ventral side depressed; seven to eight chambers in the final coil, in face view broad; periphery broad, angled, some of the chambers with a single large tooth-like projection at the periphery; wall coarsely perforate; aperture an elongated arched slit at the base of the chamber.

Diameter up to 1.5 mm.

Brady gives three stations for this species in the North Atlantic: "Off Bermuda, 435 fathoms; off Sombrero Island, 450 fathoms; and off Culebra Island, 390 fathoms." It occurs in considerable numbers in the *Albatross* dredgings off the coast of Georgia.

In the Philippines there are some very peculiar varieties of this species, but the Atlantic specimens are fairly simple.

This species was first described and figured by J. W. Bailey from off the eastern coast of the United States in 1851. Specimens from along our coast in the *Albatross* dredgings are often of just the shape and character given by Bailey. The ventral side is concave and smooth in the adult, while the dorsal side is very coarsely perforate.

Brady in the *Challenger* Report puts Bailey's species as a synonym of "*Truncatulina ungeriana* d'Orbigny," but it is not Brady's species which again is not that of d'Orbigny as noted under *Cibicides*. The spinose forms of *Anomalina semipunctata* such as figured by Brady and also figured here often occur with the nonspinose forms, and are evidently variations of the typical in this very variable species.

Hofker has placed this species as the microspheric form of *Carpenteria utricularis* (Carter). In our experience with the collections of the Western Atlantic, *Carpenteria* does not occur with this *Anomalina*, and both microspheric and megalospheric specimens of *Anomalina semipunctata* seem to occur, although sections should be made to determine this point with certainty.

Anomalina semipunctata—Material examined

Catalogue No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
			Albatross	° ′ ″ ° ′ ″				
21892	U.S.N.M.	5	D2314	32 43 00 N.; 77 51 00 W.	159	47.4	crs. s., bk. zs.	Common.
21893	U.S.N.M.	1	D2355	20 56 48 N.; 86 27 00 W.	399	------	yl. oz	Rare.
21894	U.S.N.M.	2	D2416	31 26 00 N.; 79 07 00 W.	276	53.8	co., bvk. sh.	Abundant.
21895	U.S.N.M.	10+						
21896	U.S.N.M.	1	D2644	25 40 00 N.; 80 00 00 W.	193	43.4	gy. s	Rare.
21897	U.S.N.M.	1						
21898	U.S.N.M.	1	D2660	28 40 00 N.; 78 46 00 W.	504	45.7	yl. for	Do.
21899	U.S.N.M.	3	D2668	30 58 30 N.; 79 38 30 W.	294	46.3	gy. s., dd. co.	Do.
13051	J.A.C.	1	----------	Off Government Cut, Miami, Fla.	118	------	--------------	Do.

ANOMALINA AMMONOIDES Reuss

There are numerous records for this species in the present oceans, but they do not seem to be identical with Reuss's species. They should be studied for possibility of several species with local distributions. The species referred to by Reuss is very different, and is named here *Anomalina flintii*, and the *Nautilus ammonoides* of Gronovius is a still different form.

ANOMALINA GROSSERUGOSA Reuss

Many records for this species are evidently not the same as that described by Reuss. It has been the custom to refer many things to *A. grosserugosa* and *A. ammonoides* so that there is much confusion in regard to Recent material passing under those names.

ANOMALINA GLOBIGERINOIDES Egger

This species described by Egger from numerous stations is difficult to make out from the figure. I examined material from several of the stations in Egger's collection in Munich from which it was recorded, but failed to find any specimens.

Terquem describes and figures numerous things from Recent collections off Dunkerque as *Anomalina*, but they probably all belong to *Cibicides*. They are *Anomalina hemisphaerica* Terquem, *A. limbata* Terquem, *A. nodulosa* Terquem, *A. scutellata* Terquem, and *A. simplex*

Terquem. Another species described from off Norway by Terquem as *A. irregularis* is also probably an irregular *Cibicides*.

ANOMALINA FLINTII, new species

Plate 18, figures 5 *a–c*

Anomalina ammonoides Flint (not Reuss), Ann. Rep't. U. S. Nat. Mus., 1897 (1899), p. 335, pl. 78, fig. 4.

Test biconvex, periphery rounded, dorsal side showing all the coils, ventral side showing a slight amount of the earlier coiling; chambers numerous, as many as fifteen in the last-formed coil, increasing very gradually and evenly in size as added; sutures strongly limbate on both sides, those of the dorsal side uniting with the raised spiral suture; wall very coarsely perforate, the dorsal side further ornamented by the raised sutures; aperture slightly ventral to the median line.

Diameter up to nearly 1 mm.

Holotype (Cat. No. 21882, U. S. N. M.), from *Albatross* Station D 2352 in 463 fathoms off the west coast of Cuba.

This fine species is very abundant at the *Albatross* station from which Flint originally recorded it, and appears to be localized, as it has not occurred elsewhere in the *Albatross* or other dredgings.

Anomalina flintii—Material examined

Catalogue No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
			Albatross	° ′ ″ ° ′ ″				
21882	U.S.N.M.	1	D2352	22 35 00 N.; 84 23 00 W.	463	45	wh. co.	Abundant.
21883	U.S.N.M.	4						

ANOMALINA BALTHICA (Schroeter)

Plate 19, figures 3 *a–c*

Nautilus balthicus Schroeter, Einleitung, vol. 1, 1783, p. 20, pl. 1, fig. 2.

Operculina complanata Parker and Jones (not d'Orbigny), Ann. Mag. Nat. Hist., ser. 2, vol. 19, 1857, p. 285, pl. 11, figs. 3, 4.

Nonionina elegans Williamson, Rec. Foram. Gt. Britain, 1858, p. 35, pl. 3, figs. 74, 75.

Operculina ammonoides Parker and Jones (not Gronovius), Introd. Foram. Appendix, 1862, p. 810.—H. B. Brady, Trans. Linn. Soc. Zool., vol. 24, 1864, p. 474; Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 745, pl. 92, figs. 1, 2.—Wright, Proc. Roy. Irish Acad., ser. 3, vol. 1, 1891, p. 493.—Woodward, The Observer, vol. 4, 1893, p. 201.—Egger, Abhandl. kön. bay. Akad. Wiss. München, Cl. II, vol. 18, 1893, p. 434, pl. 20, figs. 38, 39.—Silvestri, Mem. Accad. Pont. Nuovi Lincei, vol. 9, 1893, p. 217, pl. 6, fig. 5.—Goës, Kongl. Svensk. Vet. Akad. Handl., vol. 25, No. 9, 1894, p. 105, pl. 17, fig. 833.—Jones, Foram. Crag, pt. 4, 1897, p. 364, pl. 7, figs. 34 *a, b*,—Kiaer, Rep't. Norwegian Fish. and Mar. Invest., vol. 1, No. 7, 1900, p. 51.—Wright, Irish Nat., vol. 9, 1900, p. 55.—Fornasini, Mem. Accad. Sci. Istit. Bologna, ser. 5, vol. 10, 1902, p. 66.—Millett, Rec. Foram. Galway, 1908, p. 7.—Heron-Allen and Earland, Journ. Roy. Micr. Soc., 1909, p. 697; Proc. Roy. Irish Acad., vol. 31, pt. 64, 1913, p. 147.—CUSHMAN, Bull. 71, U. S. Nat. Mus., pt. 4, 1914, p. 37, pl. 14, fig. 7.—HERON-ALLEN and EARLAND, Trans. Zool. Soc. London, vol. 20, 1915, p. 737; Trans. Linn. Soc. London, ser. 2, vol. 11, 1916, p. 283.—CUSHMAN, Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 382.—HERON-ALLEN and EARLAND, British Antarctic Exped., Zoology, vol. 6, 1922, p. 230.—CLODIUS, Archiv. Ver. Freunde Nat. Mecklenburg, 75 Jahr., 1922, p. 144.—HANZAWA, Jap. Journ. Geol. Pal., vol. 4, 1925 (1926), p. 45.

Nummulina perforata, var. (*Operculina*) *ammonoides* PARKER and JONES, Philos. Trans., vol. 155, 1865, p. 398, pl. 14, fig. 44; pl. 17, figs. 62, 63.

Test small, compressed, nearly bilaterally symmetrical, periphery subacute to rounded; chambers very distinct, earlier ones somewhat involute, very gradually increasing in size and uniform in shape; sutures strongly limbate on both sides, slightly curved, uniting with the spiral suture to form a raised thickened spiral toward the center of each side; wall smooth, finely perforate; aperture near the periphery but extending somewhat to the ventral side.

Diameter not usually more than 0.50 mm.

This species is very abundant in the cold waters of the North Atlantic, especially on the eastern side, but does not occur in the *Albatross* dredgings from the western Atlantic. The species does not belong to *Operculina*. The early test is spired although the spire is low and the test is not bilaterally symmetrical. It is evidently a form of *Anomalina* as that genus is now used.

Heron-Allen and Earland have already indicated that Gronovius's name of *Nautilus ammonoides* was not applicable to this small, cold-water form. This is further aggravated by Reuss's species of *Anomalina ammonoides*. It is much the best procedure therefore by the rules to take up with Schroeter's name which evidently was applied to the species in question, and is the first available name.

It has always been an anomaly to have a genus like *Operculina* which has very complex species characteristics of shallow waters in the tropics include this small species of very cold and often deep waters.

Anomalina balthica—Material examined

Catalogue No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
13041	J.A.C.	1	*Flying Falcon* Log. 8	10 mi. S. of Glencoe, Ireland.	53	------	------------	Abundant.
13042	J.A.C.	10+						
10185	J.A.C.	10+						
13043	J.A.C.	1	*Lord Bandon* Log. 33	Nymph Bank, S. of Cork Harbor, Ireland.	52.5	------	------------	Rare.
13044	J.A.C.	2	Log. 42	Off Bantry Bay, SW. Ireland.	37.5	------	------------	Do.
10184	J.A.C.	10+	Log. 58	do	110	------	------------	Abundant.
13045	J.A.C.	10+	*Goldseeker* Haul 23	Arnish Point, The Minch.	-------	------	------------	Do.
21880	U.S.N.M.	2	*Goldseeker*	61° 34′ 00″ N.; 2° 4′ 00″ E.	-------	------	------------	Rare.
21881	U.S.N.M.	1	do	59 41 00 N.; 8 00 00 W.	-------	------	------------	Do.

Genus **PLANULINA** d'Orbigny, 1826

Planulina d'Orbigny, Ann. Sci. Nat., vol. 7, 1826, p. 280.—Cushman, Special Publ. No. 1, Cushman Lab. Foram. Res., 1928, p. 318.
Anomalina (part) of Authors.
Truncatulina (part) of Authors.

Genotype, by designation.—*Planulina ariminensis* d'Orbigny.

Test in the young trochoid, in the adult very much compressed, evolute, the earlier chambers visible from both sides of the test in the megalospheric form, in the microspheric form with the central area raised on the dorsal side; wall calcareous, coarsely perforate; aperture at the base of the chamber at the median line.

Cretaceous to Recent.

PLANULINA ARIMINENSIS d'Orbigny

Planulina ariminensis d'Orbigny, Ann. Sci. Nat., vol. 7, 1826, p. 280, pl. 5, figs. 1–3 bis; Modèles No. 49.—Cushman, Contr. Cushman Lab. Foram. Res., vol. 5, 1929, p. 102, pl. 15, figs. 3, 4.
Planorbulina ariminensis Parker, Jones, and H. B. Brady, Ann. Mag. Nat. Hist., ser. 3, vol. 16, 1865, p. 26, pl. 3, fig. 78.
Anomalina ariminensis H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 674, pl. 93, figs. 10, 11.

Test generally planispiral, somewhat evolute on both sides, very much compressed, periphery truncate, sides of the test flattened and nearly parallel, with a very slight umbo on the ventral side; chambers distinct, narrow and strongly curved; sutures distinct, strongly limbate; wall coarsely perforate, the sutures and umbonate portion on the ventral side often papillate; aperture at the periphery and extending over on the dorsal side along the inner border of the chamber.

Length up to about 1 mm.; thickness 0.15 mm.

Brady's figures in the *Challenger* Report of specimens from Southeast of Pernambuco, Brazil, are very typical. He also records the species from the North Atlantic, 150 to 1,600 fathoms, and from the South Atlantic, 350 and 2,200 fathoms. In the *Albatross* material, the species does not seem to be present in the western Atlantic.

PLANULINA WUELLERSTORFI (Schwager) (?)

Plate 19, figures 5, 6

Anomalina wuellerstorfi Schwager, *Novara*-Exped., Geol. Theil., vol. 2, 1866, p. 258, pl. 7, figs. 105, 107.
Truncatulina wuellerstorfi H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 662, pl. 93, figs. 8, 9.
Planulina wuellerstorfi Cushman, Contr. Cushman Lab. Foram. Res., vol. 5, 1929, p. 104, pl. 15, figs. 1, 2.

Test much compressed, early stages trochoid later ones somewhat spread out, periphery rounded, ventral side somewhat convex or at least umbonate, dorsal side nearly flat; chambers numerous, narrow; sutures distinct, limbate, curved, on the ventral side with a decided angle; wall coarsely perforate, the sutures and the spiral suture raised especially on the dorsal side; aperture at the periphery and extending over onto the dorsal side along the inner margin of the chamber, with a slight lip.

Diameter up to 1 mm.; thickness, 0.15 to 0.35 mm.

This species was described from the Pliocene of Kar Nicobar by Schwager. It has been recorded as "*Truncatulina wuellerstorfi*" by many authors from widely scattered stations and from various fossil deposits. There is a great variation in the thickness of the test and the amount of involution. It tends toward *Cibicides* in many specimens. There is much variation also as in other species of this family in the amount of sculpture of the surface due to excess of lime and a thickening of the test. The species is fairly common in deep water of many parts of the present oceans.

PLANULINA FOVEOLATA (H. B. Brady)

Plate 20, figures 2, 3

Anomalina foveolata H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 674, pl. 94, figs. 1 *a–c*.—Heron-Allen and Earland, British Antarctic Exped., Zoology, vol. 6, 1922, p. 233.

Anomalina ariminensis H. B. Brady, Parker, and Jones (part) (not d'Orbigny), Trans. Zool. Soc. London, vol. 12, 1888, p. 228, pl. 45, figs. 21*a*, *b* (not 21, 22).

Discorbina biconcava Flint (not Jones and Parker), Ann. Rep't. U. S. Nat. Mus., 1897 (1899), p. 327, pl. 72, fig. 5.

Test nearly planispiral, compressed, plano-convex, periphery thick and rounded, early whorls visible from both sides of the test; chambers 9 to 11 in the last-formed whorl, distinct; sutures oblique, distinct, on the flattened side slightly depressed and slightly limbate, on the convex side raised, especially over the early portion; wall coarsely perforate, on the flattened side fairly smooth, on the convex side sculptured and deeply pitted; aperture mostly peripheral, extending slightly onto the flattened side.

Diameter 0.50 to 0.70 mm.

The only *Challenger* station for this species was off Bermuda in 435 fathoms. Heron-Allen and Earland record it from off the coast of Rio de Janeiro, 40 fathoms, a single specimen. Egger records it from off Mauritius, but the figure he gives is not very convincing. It has occurred rarely in the *Albatross* collections from the Western Atlantic. It may be noted that Brady, Parker, and Jones record a specimen from the Abrohlos Bank as "*Anomalina ariminensis*" which seems to be this species.[46]

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[46] Trans. Zool. Soc., London, vol. 12, 1888, pl. 45, fig. 21.

Planulina foveolata—*Material examined*

Catalogue No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
			Albatross	° ′ ″ ° ′ ″				
21915	U.S.N.M.	1	D2399	28 44 00 N.; 86 18 00 W.	196	51.6	gy. m.	Rare.
21916	U.S.N.M.	7	D2400	28 41 00 N.; 86 07 00 W.	169		gy. m.	Common.
21917	U.S.N.M.	1	D2629	23 48 40 N.; 75 10 40 W.	1,169	38.4	co. s.	Rare.
21918	U.S.N.M.	1		Off Government Cut, Miami, Fla.	75			Do.
13052	J.A.C.	6		Off Sambo Key, Fla.	50			Few.
21919	U.S.N.M.	2		do.	58			Rare.
21920	U.S.N.M.	1		Off Ragged Reef, Fla.	70			Do.
13053	J.A.C.	1		Off Ragged Key, Fla.	71			Do.
13054	J.A.C.	2		do.	75			Do.
21921	U.S.N.M.	1		Off Ragged Reef, Fla.	85			Do.
21922	U.S.N.M.	6		Off Sand Key, Fla.	85			Few.
21923	U.S.N.M.	2		Off Fowey Light, Fla.	40			Rare.
21924	U.S.N.M.	1		do.	45			Do.
13055	J.A.C.	1		do.	60			Do.
13056	J.A.C.	2		Off Key West, Fla.	78			Do.
21925	U.S.N.M.	1		Off Fowey Light, Fla.	78			Do.

PLANULINA CARIBAEA, new species

Plate 20, figures 1 *a*–c

Test planispiral or nearly so, much compressed, evolute, consisting of about two and a half coils, periphery rounded, ventral side slightly concave near the middle; chambers distinct, rather rapidly increasing in size in the last part of the final coil; sutures distinct, slightly limbate, joining with the slight keel, very slightly depressed on the ventral side; wall smooth, on the dorsal side with the perforations very distinct, ventral side very finely perforate; aperture near the periphery, small, low.

Length of holotype, 0.42 mm.; breadth, 0.30 mm.; thickness, 0.06 mm.

Holotype (Cushman Coll. No. 13,143) from Montego Bay, Jamaica.

This is an interesting and very distinct species which is probably to be found widely distributed in the West Indian region. It most closely resembles some of the species of the Australian region.

There are various species assigned to *Planulina* by Ehrenberg which do not belong in this genus. Numbers of these are from Atlantic records, and it seems that many of them are *Globorotalia menardii* (d'Orbigny) while others are probably some of the flatter forms of *Globigerina*. The Atlantic ones may be noted here for reference:

Planulina abyssicola Ehrenberg (Abhandl. Akad. Wiss. Berlin, 1872 (1873), pl. 1, fig. 15). Davis Strait, 9,240 feet in depth.

P. depressa Ehrenberg (Abhandl. Akad. Wiss. Berlin, 1872 (1873), pl. 1, fig. 20). Davis Strait, 6,000 feet in depth.

P. diaphana Ehrenberg (Abhandl. Akad. Wiss. Berlin, 1872 (1873), pl. 5, fig. 10). Gulf Stream, near Florida, 2,556 feet in depth.

P. groenlandica Ehrenberg (Abhandl. Akad. Wiss. Berlin, 1872 (1873), pl. 1, fig. 17). Davis Strait, 10,998 feet in depth.

P. heterocyclia Ehrenberg (Abhandl. Akad. Wiss. Berlin, 1872 (1873), pl. 4, fig. 6). Atlantic Telegraph Line, 1856, from 9,540 feet in depth.

P. laevigata Ehrenberg (Abhandl. Akad. Wiss. Berlin, 1872 (1873), pl. 1, fig. 10). Davis Strait, 6,000 feet in depth.

P. leptoderma Ehrenberg (Abhandl. Akad. Wiss. Berlin, 1872 (1873), pl. 5, fig. 8). Gulf Stream, near Florida, 9,066 feet in depth.

P. mauryana Ehrenberg (Abhandl. Akad. Wiss. Berlin, 1872 (1873), pl. 3, fig. 1). Atlantic Telegraph Line, 1856, from 11,580 feet in depth.

P. megalopentas Ehrenberg (Abhandl. Akad. Wiss. Berlin, 1872 (1873), pl. 4, fig. 7). Atlantic Telegraph Line, 1856, from 9,600 feet in depth.

P. micropentas Ehrenberg (Abhandl. Akad. Wiss. Berlin, 1872 (1873), pl. 4, fig. 8). Atlantic Telegraph Line, 1856, from 9,600 feet in depth.

P. perihexas Ehrenberg (Abhandl. Akad. Wiss. Berlin, 1872 (1873), pl. 3, fig. 13). Atlantic Telegraph Line, 1856, from 9,780 feet in depth.

P. seriata Ehrenberg (Abhandl. Akad. Wiss. Berlin, 1872 (1873), pl. 5, fig. 9). Gulf Stream, near Florida, 9,066 feet in depth.

P. sphaerocharis Ehrenberg (Abhandl. Akad. Wiss. Berlin, 1872 (1873), pl. 4, fig. 9). Atlantic Telegraph Line, 1856, from 2,460 feet in depth.

P. tenuis Ehrenberg (Abhandl. Akad. Wiss. Berlin, 1872 (1873), pl. 3, fig. 2). Atlantic Telegraph Line, 1856, from 9,780 feet in depth.

P. erosa Ehrenberg (Mikrogeologie, 1854, pl. 35, iv, i). Bottom sample, Atlantic Ocean.

Genus LATICARININA Galloway and Wissler, 1928

Laticarinina Galloway and Wissler, Journ. Pal., vol. 1, 1927–28 (1928), p. 193.—Cushman, Special Publ. No. 1, Cushman Lab. Foram. Res., 1928, p. 318.

Pulvinulina (part) of Authors.

Pellatispira Cushman, 1927 (not Boussac).

Carinina Galloway and Wissler, 1927 (not Rubrecht).

Genoholotype.—Pulvinulina repanda, var. *menardii,* subvar. *pauperata* Parker and Jones.

Test typically plano-convex, the dorsal side flattened, ventral side convex, in the early stages especially of the microspheric form trochoid, the aperture on the periphery or even on the ventral side as in *Cibicides*, later on the margin on the dorsal side, a low, elongate opening at the base of the chamber, a wide flange of clear material separating the later coils and forming a carina about the periphery.

Eocene to Recent.

This genus was referred by Galloway and Wissler to the Lagenidae, but the early stages are trochoid and the stages connecting it with others of the Anomalinidae are well marked.

LATICARININA PAUPERATA (Parker and Jones)

Plate 20, figures 4 *a–c*; plate 21, figures 1 *a–c*

Pulvinulina repanda, var. *menardii*, subvar. *pauperata* Parker and Jones, Philos. Trans., vol. 155, 1865, p. 395, pl. 16, figs. 50, 51.

Pulvinulina pauperata H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 696, pl. 104, figs. 3–11; Quart. Journ. Geol. Soc., vol. 44, 1888, p. 10.—Egger, Abhandl. kön. bay. Akad. Wiss. München, Cl. II, vol. 18, 1893, p. 412, pl. 17, figs. 32–34.—Chapman, Proc. Zool. Soc. London, 1895, p. 42.—Goës, Bull. Mus. Comp. Zoöl., vol. 29, 1896, p. 77.—Flint, Ann. Rept. U. S. Nat. Mus., 1897 (1899), p. 330, pl. 74, fig. 3.—Chapman, Journ. Linn. Soc. Zool., vol. 30, 1910, p. 423.—Schubert, Abhandl. k. k. geol. Reichsanst., vol. 20, pt. 4, 1911, p. 112.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 5, 1915, p. 61, pl. 23, figs. 2, 3; Bull. 100, vol. 4, 1921, p. 340, pl. 68, fig. 2.—Heron-Allen and Earland, British Antarctic Exped., Zool., vol. 6, 1922, p. 217.—Koch, Ber. Schweiz. Pal. Ges., vol. 18, 1923, p. 351; vol. 19, No. 3, 1926, p. 728.—Yabe and Hanzawa, Jap. Journ. Geol. Pal., vol. 4, 1925 (1926), p. 52.—Nuttall, Quart. Journ. Geol. Soc., vol. 84, 1928, p. 100.

Pellatispira pauperata Cushman, Bull. Scripps Instit. Oceanography, Tech. Ser., vol. 1, 1927, p. 176, pl. 6, fig. 13.

Test in the young, trochoid, in the adult becoming planispiral or nearly so, early chambers close coiled, later ones becoming loosely coiled with a broad plate between the coils; periphery with a broad, thin, transparent carina; chambers numerous, inflated, ten to fifteen in the last-formed coil; sutures depressed; aperture a narrow opening on the ventral side near the periphery.

Brady records this species from "12 localities in the North Atlantic, at depths of 390 to 2,176 fathoms, its northern limit being about latitude 56° N.: at four Stations in the South Atlantic 675 to 2,350 fathoms." It is common in a few of the *Albatross* stations, especially from the Gulf of Mexico.

Laticarinina pauperata—Material examined

Catalogue No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
			Albatross	° ′ ″ ° ′ ″				
21900	U. S. N. M.	3	D2150	13 34 45 N.; 81 21 10 W	382	45.8	wh. crs. s	Rare.
21901	U. S. N. M.	8	D2144	9 49 00 N.; 79 31 30 W	896		gn. m	Common.
21902	U. S. N. M.	2	D2144	9 49 00 N.; 79 31 30 W	896		gn. m	Do.
21903	U. S. N. M.	2	D2314	32 43 00 N.; 77 51 00 W	159	47.4	crs. s., bk. sp	Rare.
21904	U. S. N. M.	1	D2381	28 05 00 N.; 87 56 15 W	1330		lt. br. m	Do.
21905	U. S. N. M.	1	D2381	28 05 00 N.; 87 56 15 W	1330		lt. br. m	Do.
21906	U. S. N. M.	1	D2385	28 51 00 N.; 88 18 00 W	730	40.1	gy. m	Do.
21907	U. S. N. M.	1	D2385	28 51 00 N.; 88 18 00 W	730	40.1	gy. m	Do.
21908	U. S. N. M.	2	D2392	28 47 30 N.; 87 27 00 W	724	40.7	br. gy. m	Do.
21909	U. S. N. M.	4	D2394	28 38 30 N.; 87 02 00 W	420	41.8	gn. m	Few.
12910	U. S. N. M.	1	D2679	32 40 00 N.; 76 40 30 W	782	38.6	lt. gy. oz	Rare.
12911	U. S. N. M.	1	D2751	16 54 00 N.; 63 12 00 W	687	40	bu. glob. oz	Do.
12912	U. S. N. M.	1	D2751	16 54 00 N.; 63 12 00 W	687	40	bu. glob. oz	Do.
12913	U. S. N. M.	1	D2754	11 40 00 N.; 58 33 00 W	880	38	glob. oz	Do.
12914	U. S. N. M.	1	D2760	12 07 00 S.; 37 17 00 W	1019	39.5	br. co	Do.

Brady says that this species "is essentially a deep-water Foraminifer, and there is no reason to suppose that it is, under any circumstances, a pelagic species." It is noteworthy, however, that it usually occurs in *Globigerina*-ooze associated with pelagic species, and the same is true of the fossil occurrences.

There are other species in the Pacific which connect this with typical *Cibicides* and other genera of the Anomalinidae.

Genus ANOMALINELLA Cushman, 1927

Anomalinella Cushman, Contr. Cushman Lab. Foram. Res., vol. 3, 1927, p. 93; Special Publ. No. 1, Cushman Lab. Foram. Res., 1928, p. 322.

Truncatulina (part) of Authors.

Genoholotype.—Truncatulina rostrata H. B. Brady.

Test in the early stages trochoid, in the adult nearly planispiral and with the chambers almost entirely involute; wall calcareous, coarsely perforate; aperture on the ventral margin of the last-formed chamber between the periphery and the umbilical area with a supplementary aperture just below the peripheral margin, elongate and parallel to the axis of coiling.

Miocene (?) to Recent.

This genus seems to be limited to the Indo-Pacific.

Subfamily 2. CIBICIDINAE

Test with the dorsal side flattened or concave, the aperture extending over onto the dorsal side along the inner margin of the chamber or entirely on the dorsal side, test typically attached by the dorsal side.

Genus CIBICIDES Montfort, 1808

Cibicides Montfort, Conch. Syst., vol. 1, 1808, p. 123.—Cushman, Special Publ. No. 1, Cushman Lab. Foram. Res., 1928, p. 322.

Storilus Montfort (?), Conch. Syst., vol. 1, 1808, p. 131 (genoholotype, *Storilus radiatus* Montfort).

Polyxenes Montfort (?), Conch. Syst., vol. 1, 1808, p. 139 (genoholotype, *Polyxenes cribratus* Montfort = *Nautilus farctus* Fichtel and Moll).

Nautilus (part) of Authors.

Truncatulina d'Orbigny, Ann. Sci. Nat., vol. 7, 1826, p. 279 (genotype, by designation, *Cibicides refulgens* Montfort).

Lobatula Fleming, Hist. Brit. Anim., 1828, p. 232 (genoholotype, *Lobatula vulgaris* Fleming).

Rosalina and *Rotalina* (part) of Authors.

Aristeropora Ehrenberg, Monatsber. k. preuss. Akad. Wiss. Berlin, 1858, p. 11 (genotype, by designation, *Aristeropora graeca* Ehrenberg).

Heterolepa Franzenau, Termeszetrajzi Füsetek, vol. 8, 1884, p. 181 (genotype, by designation, *Rotalina dutemplei* d'Orbigny).

Pseudotruncatulina Andreae, Abhandl. geol. Special karte Elsass-Lothr., vol. 2, pt. 3, 1884, p. 213 (genoholotype, *Rotalina dutemplei* d'Orbigny).

Genoholotype.—Cibicides refulgens Montfort.

Test plano-convex, usually attached to various objects by the flattened dorsal side, trochoid; wall calcareous, coarsely perforate; aperture peripheral, at the base of the chamber, sometimes extending ventrally, but typically with a long slit-like extension between the inner margin of the chamber on the dorsal side and the previous whorl nearly or fully the length of the chamber.

Cretaceous to Recent.

The genus *Cibicides* and its related *Planulina* present one of the most baffling problems in the Foraminifera. Many of the forms are attached which give varied form to the general shape of the test. In addition there is a very great difference between the megalospheric and microspheric forms. The latter becomes progressively more spread out and campanulate, the chambers becoming long and narrow but the ventral side usually with the chambers extending into the umbo. In many of the forms there is a great variation in the surface characters due to thickening of the test and consequently a greater amount of surface irregularity and ornamentation.

The whole group should be studied with *Planulina* with large series, and sections made to determine the relationships of the size of the proloculum to the various forms.

The literature is also very involved, as names have been used in a particularly loose sense without reference to the original types which are in many cases only different from the forms later assigned to them. In the following pages are given a few of the species of the Atlantic which seem fairly well characterized:

CIBICIDES REFULGENS Montfort

Plate 21, figures 2 *a–c*

"Hammonia *Balanus* seu *Balanoidea*," Soldani, Testaceographia, vol. 1, pt. 1, 1789, p. 58, pl. 46, figs. *nn*, *oo*.

Cibicides refulgens Montfort, Conch. Syst., vol. 1, 1808, p. 122.—Cushman, Special Publ. No. 1, Cushman Lab. Foram. Res., 1928, pl. 50, figs. 2 *a–c*.

Truncatulina refulgens d'Orbigny, Ann. Sci. Nat., vol. 7, 1826, p. 279, pl. 13, figs. 8–11; Modèles, No. 77.—Carpenter, Parker, and Jones, Introd. Foram., 1862, p. 201, fig. 32, *E*.—Parker, Jones, and H. B. Brady, Ann. Mag. Nat. Hist., ser. 3, vol. 16, 1865, p. 31, pl. 2, fig. 76.—H. B. Brady, Nat. Hist. Trans. Northumberland and Durham, vol. 1, 1865–1867 (1867), p. 105, pl. 12, fig. 9 *a–c*.—Parker, Jones, and H. B. Brady, Ann. Mag. Nat. Hist., ser. 4, vol. 8, 1871, p. 176, pl. 12, fig. 139.—Terrigi, Atti Accad. Pont. Nuovi Lincei, vol. 35, 1883, p. 197, pl. 3, fig. 40.—H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 659, pl. 92, figs. 7–9.—Sherborn and Chapman, Journ. Roy. Micr. Soc., 1886, p. 756, pl. 16, fig. 13 *a–c*.—Terrigi, Mem. Accad. Lincei, ser. 4, vol. 6, 1889, p. 117, pl. 8, figs. 1–3.—Egger, Abhandl. kön. bay. Akad. Wiss. München, Cl. II, vol. 18, 1893, p. 401, pl. 16, figs. 31–33.—Goës, Kongl. Svensk. Vet. Akad. Handl., vol. 25, No. 9, 1894, p. 89, pl. 15, figs. 775, 776.—Jones, Pal. Soc., 1895, p. 302, pl. 5, fig. 31.—Chapman, Journ. Roy. Micr. Soc., 1898, p. 1, pl. 1, fig. 1.—Millett, Journ. Roy. Micr. Soc., 1904, p. 491.—

Chapman, Journ. Quekett Micr. Club, ser. 2, vol. 10, 1907, p. 137.—Bagg, Proc. U. S. Nat. Mus., vol. 34, 1908, p. 158.—Sidebottom, Mem. and Proc. Manchester Lit. and Philos. Soc., vol. 53, No. 21, 1909, p. 2.—Chapman, Proc. Roy. Soc. Victoria, vol. 22, 1910, p. 284; Journ. Linn. Soc., Zoology, vol. 30, 1910, p. 420.—Bagg, U. S. Geol. Surv., Bull. 513, 1912, p. 83.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 5, 1915, p. 30, pl. 12, fig. 2; figs. 33 *a–c* (in text).—Heron-Allen and Earland, Trans. Zool. Soc. London, vol. 20, 1915, p. 707; Journ. Roy. Micr. Soc., 1916, p. 51; Trans. Linn. Soc. London, vol. 11, ser. 2, 1916, p. 274.—Chapman, Rep't. British Antarctic Exped. Geol., vol. 2, 1916 (1917), pp. 33, 45, 69, pl. 3, fig. 25.—Cushman, Bull. 676, U. S. Geol. Surv., 1918, p. 61, pl. 18, figs. 3 *a–c*; Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 312, pl. 63, figs. 1 *a–c*; 13th Ann. Rep't., Florida Geol. Surv., 1921, p. 50.—Heron-Allen and Earland, Bull. Soc. Sci. Hist. Nat. Corse, 1922, p. 137; British Antarctic Exped., Zool., vol. 6, 1922, p. 207, pl. 7, figs. 23, 28; Journ. Roy. Micr. Soc., 1924, p. 175; Journ. Linn. Soc. Zool., vol. 35, 1924, p. 635.—Hanzawa, Jap. Journ. Geol. Pal., vol. 4, 1925 (1926), p. 43 (table).—Chapman, New Zealand Geol. Surv., Pal. Bull. No. 11, 1926, p. 78, pl. 15, fig. 13.—Nuttall, Quart. Journ. Geol. Soc., vol. 84, 1928, p. 98.—Heron-Allen and Earland, Journ. Roy. Micr. Soc., 1930, p. 187.

Test strongly plano-convex, dorsal attached side flattened or slightly concave, ventral side very convex, periphery acute, keeled; chambers numerous, 7 to 9 or more in the last-formed whorl, all chambers visible from the dorsal side, those of the last-formed whorl only visible from the ventral side; sutures slightly depressed on the ventral side, on the dorsal side usually flush and somewhat limbate; wall fairly smooth, finely perforate; aperture narrow at the periphery and extending onto the dorsal side along the inner margin of the chamber.

Diameter up to 1.5 mm.; height up to 1 mm.

This species is recorded from many regions and also as a fossil, particularly in the Tertiary. In the *Challenger* Report, Brady records it from numerous Atlantic stations, especially in cool water, but there are numerous records for it elsewhere as will be noted by the above references which probably do not all refer to the same thing.

Cibicides refulgens—Material examined

Catalogue No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
21653	U.S.N.M.	9	*Albatross* D2314	° ′ ″ ° ′ ″ 32 43 00 N.; 77 51 00 W.	159	47.4	crs. s., bk. sp	Abundant.
13117	J. A. C.	10+	*Goldseeker*	58 44 00 N.; 7 00 00 W.	-------	------	--------------	Do.
21654	U.S.N.M.	10+						
21655	U.S.N.M.	10+	..do.....	58 44 00 N.; 5 00 00 W.	-------	------	--------------	Do.
21656	U.S.N.M.	8						
13118	J. A. C.	8						
13119	J. A. C.	7	..do.....	61 34 00 N.; 2 4 00 E.	-------	------	--------------	Do.
21657	U.S.N.M.	10+						
21658	U.S.N.M.	3	..do.....	60 28 00 N.; 3 15 00 W.	-------	------	--------------	Few.
21659	U.S.N.M.	1						

CIBICIDES LOBATULA (Walker and Jacob)

Plate 21, figures 3 *a–c*

"Nautilus spiralis lobatus, etc." Walker and Boys, Test. Min., 1784, p. 20, pl. 3, fig. 71.

"Hammoniae tuberculatae, etc." Soldani, Testaceographia, vol. 1, pt. 1, 1789, p. 58, pl. 45, figs. *ii, kk, ll, mm*.

Nautilus lobatulus Walker and Jacob, Adams Essays, Kanmacher's ed., 1798, p. 642, pl. 14, fig. 36.

Serpula lobatula Montagu, Test. Brit., 1803, p. 515, Supp., p. 160.

Truncatulina lobatula d'Orbigny, in Barker Webb and Berthelot, Hist. Nat. Iles Canaries, vol. 2, pt. 2, "Foraminifères," 1839, p. 134, pl. 2, figs. 22–24; Foram. Foss. Bass. Tert. Vienne, 1846, p. 168, pl. 9, figs. 18–23.—Egger, Neues Jahrb. für Min., 1857, p. 279, pl. 9, figs. 1–3.—Parker and Jones, Ann. Mag. Nat. Hist., ser. 2, vol. 19, 1857, p. 293, pl. 10, figs. 17–21.—Williamson, Rec. Foram. Great Britain, 1858, p. 59, pl. 5, figs. 121–123.—Jones, Parker, and H. B. Brady, Mon. Foram. Crag, 1866, pl. 2, figs. 4–10; pl. 4, fig. 18.—Parker, Jones, and H. B. Brady, Ann. Mag. Nat. Hist., ser. 4, vol. 8, 1871, p. 176, pl. 12, fig. 136.—Schwager, Boll. R. Com. geol. Ital., vol. 8, 1877, p. 26, pl., fig. 49.—Terrigi, Atti Accad. Pont. Nuovi Lincei, vol. 33, 1880, p. 205, pl. 3, fig. 57.—Terquem, Mém. Soc. Géol. France, sér. 3, vol. 2, 1882, p. 94, pl. 9 (17), fig. 27*a, b*.—H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 660, pl. 92, fig. 10; pl. 93, figs. 1, 4, 5; pl. 95, figs. 4, 5.—Sherborn and Chapman, Journ. Roy. Micr. Soc., 1886, p. 756, pl. 16, fig. 12*a–c*.—Malagoli, Atti Soc. Nat. Modena (Rend.), ser. 3, vol. 3, 1887, p. 110, pl. 1, fig. 14.—H. B. Brady, Parker, and Jones, Trans. Zool. Soc., vol. 12, 1888, p. 227, pl. 42, fig. 20; pl. 45, fig. 26.—Terrigi, Mem. R. Accad. Lincei, ser. 4, vol. 6, 1889, p. 116, pl. 7, figs. 5–7.—Egger, Abhandl. kön. bay. Akad. Wiss. München, Cl. II, vol. 18, 1893, p. 396, pl. 16, figs. 1–3, 10–12.—Fornasini, Mem. Accad. Sci. Istit. Bologna, ser. 5, vol. 3, 1893, p. 435, pl. 2, figs. 15, 16.—Goës, Kongl. Svensk. Vet. Akad. Handl., vol. 25, No. 9, 1894, p. 88, pl. 15, fig. 774.—Burrows and Holland, Proc. Geol. Assoc., vol. 15, 1897, p. 47, pl. 2, fig. 24.—Morton, Proc. Portland Soc. Nat. Hist., vol. 2, 1897, p. 120.—Chapman, Journ. Roy. Micr. Soc., 1898, p. 2, pl. 1, fig. 2.—Flint, Rep't. U. S. Nat. Mus., 1897 (1899), p. 333, pl. 76, fig. 4.—Chapman, Proc. Roy. Soc. Edinburgh, vol. 23, 1902, p. 392, pl. 1, figs. 2, 3.—Millett, Journ. Roy. Micr. Soc., 1904, p. 491.—Chapman, Trans. New Zealand Inst., vol. 38, 1905, p. 103; Journ. Quekett Micr. Club, ser. 2, vol. 10, 1907, p. 137.—Bagg, Proc. U. S. Nat. Mus., vol. 34, 1908, p. 158.—Cushman, Proc. Boston Soc. Nat. Hist., vol. 34, 1908, p. 30.—Sidebottom, Mem. and Proc. Manchester Lit. and Philos. Soc., vol. 53, No. 21, 1909, p. 2.—Chapman, Proc. Roy. Soc. Victoria, vol. 22, 1910, p. 284; Journ. Linn. Soc. Zoology, vol. 30, 1910, p. 420.—Bagg, Bull. U. S. Geol. Surv., No. 513, 1912, p. 82, pl. 24, figs. 9–14.—Chapman, Zool. Res. *Endeavour*, pt. 3, 1912, p. 311.—Cushman, Rep't. Canadian Arctic Exped., 1913, p. 9.—Heron-Allen and Earland, Proc. Roy. Irish Acad., vol. 31, pt. 64, 1913, p. 132.—Pearcey, Trans. Roy. Soc. Edinburgh, vol. 49, 1914, p. 1027.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 5, 1915, p. 31, pl. 15, fig. 1; figs. 34*a–c* (in text).—Chapman, Biol. Res. *Endeavour*, vol. 3, pt. 1, 1915, p. 29.—Heron-Allen and Earland, Trans. Zool. Soc. London, vol. 20, 1915, p. 706; Trans. Linn. Soc. London, ser. 2, vol. 11, 1916, p. 274; Journ. Roy. Micr. Soc., 1916, p. 51.—Chapman, Rep't. British Antarctic Exped., Geol., vol. 2, 1916

(1917), pp. 33, 45, 69, pl. 3, fig. 26.—SIDEBOTTOM, Journ. Roy. Micr. Soc., 1918, p. 255.—HALKYARD, Mem. Proc. Manchester Lit. Philos. Soc., vol. 62, pt. 2, 1918(1919), p. 116.—CUSHMAN, Proc. U. S. Nat. Mus., vol. 56, 1919, p. 627.—MARTINOTTI, Atti Soc. Ital. Sci. Nat., vol. 59, 1920, p. 333.—CLODIUS, Archiv. Ver. Freunde Nat. Mecklenburg, 75 Jahr., 1922, p. 132.—CUSHMAN, Contrib. Canadian Biol., 1921 (1922), p. 12.—HERON-ALLEN and EARLAND, Bull. Soc. Sci. Hist. Nat. Corse, 1922, p. 137; British Antarctic Exped., Zool., vol. 6, 1922, p. 208; Journ. Linn. Soc. Zool., vol. 35, 1924, p. 635.—PAALZOW, Ber. Offenb. Ver. Nat., 1912–1924(1924), p. 26, pl. 2, figs. 9*a*, *b*.—HERON-ALLEN and EARLAND, Journ. Roy. Micr. Soc., 1924, p. 175.—APPLIN, Bull. Amer. Assoc. Petr. Geol., vol. 9, 1925, p. 25.—HANZAWA, Jap. Journ. Geol. Pal., vol. 4, 1925 (1926), p. 43 (table).—MARTINOTTI, Boll. R. Officio geol. Ital., vol. 51, 1926, p. 3 (list).—YABE and HANZAWA, Jap. Journ. Geol. Pal., vol. 4, 1925 (1926), p. 52.—KOCH, Ber. Schweiz. Pal. Ges., vol. 19, No. 3, 1926, p. 747.—CASASNOVAS, Not. Y. Res. Instit. Esp. Ocean., ser. 2, No. 29, 1928, p. 7.—NUTTALL, Quart. Journ. Geol. Soc., vol. 84, 1928, p. 98.—HERON-ALLEN and EARLAND, Journ. Roy. Micr. Soc., 1930, p. 187.

Planorbulina farcata, var. (*Truncatulina*) *lobatula* PARKER and JONES, Philos. Trans., vol. 155, 1865, p. 381, pl. 14, figs. 3–6; pl. 16, figs. 18–20.

Planorbulina lobatula GOËS, Kongl. Svensk. Vet. Akad. Handl., vol. 25, No. 9, 1894, p. 88, pl. 15, fig. 774.

Truncatulina miquelonensis D'ORBIGNY, Ann. Sci. Nat., vol. 7, 1826, p. 279, No. 7.—FORNASINI, Mem. R. Accad. Sci. Istit. Bologna, ser. 6, vol. 3, 1906, p. 69, pl. 4, fig. 9.

Test plano-convex, typically adherent by the dorsal side, dorsal face flattened or concave, ventral side moderately convex, peripheral margin acute or rounded, slightly keeled; chambers numerous, usually seven in the last-formed whorl; sutures distinct, depressed slightly on the ventral side, flush and limbate on the dorsal side, on the ventral side nearly radial, dorsal ones curved; wall usually smooth, but sometimes ornamented with thickenings especially on the ventral side, rather coarsely perforate; aperture at the periphery and extending over and along the inner margin of the chamber on the dorsal side.

Diameter up to 1.2 mm.; thickness up to 0.35 mm.

This is a very common species in cool waters attached to hydroid stems, algae and almost any sort of support. It often comes in on northern beaches in considerable numbers after storms. There is considerable variation in the species, but the variation seems to be within very definite limits. There are various other names used by Terquem and others for this species.

Cibicides lobatula—Material examined

Catalogue No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
21926	U.S.N.M.	2	*Albatross* D2063	42° 23′ 00″ N.; 66° 23′ 00″ W.	141	46	s. crs. g.	Rare.
13057	J.A.C.	7		Newport Beach, Newport, R. I.				Common.
13058	J.A.C.	3		Nantasket Beach, Mass.				Rare.
13059	J.A.C.	1		Revere Beach, Mass.				Do.
13060	J.A.C.	4		Nahant Beach, Nahant, Mass.				Few.
13061	J.A.C.	3		Hampton Beach, N. H.				Abundant.
13062	J.A.C.	9		do.				Do.
13063	J.A.C.	10+		do.				Do.
13064	J.A.C.	7	21	Casco Bay, Me.				Abundant.
13065	J.A.C.	10+	21	do.				Do.
13066	J.A.C.	10+	2	do.				Do.
13067	J.A.C.	10+	2	do.				Do.
13068	J.A.C.	10+	3	do.				Do.
13069	J.A.C.	6	10	do.				Few.
13070	J.A.C.	10+	11	do.				Abundant.
13071	J.A.C.	10+	11	do.				Do.
13072	J.A.C.	10+		Off Cape Porpoise, Me.				Do.
13073	J.A.C.	9		Penobscot Bay, Me.				Common.
13074	J.A.C.	4		Cove between Lubec and Quoddy Head, Me.				Few.
13075	J.A.C.	2		Cobscook Bay, near Eastport, Me.				Rare.
13076	J.A.C.	10+		Off Trials Id., near Eastport, Me.				Abundant
13077	J.A.C.	10+		do.				Do.
13078	J.A.C.	10+		do.				Do.
13079	J.A.C.	10+		Eastport, Me.				Do.
13080	J.A.C.	9		do.				Do.
2899	J.A.C.	5		Gaspe Bay	30–40			Do.
13081	J.A.C.	10+		do.				Do.
2894	J.A.C.	3		Hudson Bay	15–20		s. st.	Do.
2895	J.A.C.	3		do.	15–20		s. st.	Do.
2896	J.A.C.	8		do.	15–20		s. st.	Do.
13082	J.A.C.	10+		Coast of Iceland				Do.
2898	J.A.C.	10		Dröbach, Norway				Do.
13083	J.A.C.	10+		Kiollie Fiord, Norway	4			Do.
13084	J.A.C.	10+		Grace Holman Harbor, Norway.	2.5			Do.
13085	J.A.C.	10+		Brodnick Roadstead, Norway.	6			Do.
13086	J.A.C.	10+		Croquer Id. Anchorage, Norway.	10			Do.
13087	J.A.C.	10+		Off Plymouth, England				Do.
13088	J.A.C.	10+		Dogs Bay, Ireland				Do.
13089	J.A.C.	10+	*Lord Bandon* Log. 33.	Nymph Bank, S. of Cork Harbor, Ireland.	52.5			Do.
13090	J.A.C.	10+		do.	52.5			Do.
13091	J.A.C.	10+	42	Off Bantry Bay, Ireland	37.5			Do.
13092	J.A.C.	7	*Flying Falcon* Log. 8.	10 mi. S. of Glencoe, Ireland	53			Common.
13095	J.A.C.	10	*Goldseeker*	Off Nose Head, Moray Firth.				Abundant.
21927	U.S.N.M.	10+	*Goldseeker*	do.				Do.
21928	U.S.N.M.	10+	*Goldseeker*	North Sound, Orkney Ids.				Do.
13093	J.A.C.	6	*Goldseeker* Haul 23	Arnish Point, off the Minch.				Few.
13094	J.A.C.	10	*Goldseeker*	58° 52′ 00″ N.; 1° 37′ 00″ W.				Abundant.
21929	U.S.N.M.	9	*Goldseeker*	58° 52′ 00″ N.; 1° 37′ 00″ W.				Do.

CIBICIDES CONCENTRICA (Cushman)

Plate 21, figures 4, 5; plate 22, figures 1, 2

Truncatulina concentrica Cushman, Bull. 676, U. S. Geol. Surv., 1918, p. 64, pl. 21, fig. 3; Bull. 4, Fla. Geol. Survey, 1930, p. 61, pl. 12, figs. 4*a–c*.

Test nearly plano-convex, dorsal side nearly flat, ventral side convex, periphery subcarinate to rounded; chambers distinct, seven to nine in the adult whorl, the inner end on the dorsal side with a definite proximal portion, fusing with adjacent ones to form a concentric band about the middle, and more or less separated by a series of depressions; sutures deep on the ventral side, slightly limbate and flush on the dorsal side; wall smooth, finely perforate; aperture largely dorsal, with a thin lip; color usually deep yellowish-brown.

Diameter up to 0.80 mm.

This species described from the Miocene, Choctawhatchee marl of Florida, is common living off the coast of Florida and adjacent waters in comparatively shallow depths. The early stages are somewhat similar to *Cibicides americana* (Cushman), but adults normally show the peculiar projections of the chambers. It is probable that the form figured by H. B. Brady, Parker and Jones from the Abrohlos Bank off Brazil belongs here.[47]

Cibicides concentrica—Material examined

Cat. No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
			Albatross	° ′ ″ ° ′ ″				
21566	U.S.N.M	10+	D2112	35 20 50 N.; 75 18 00 W	16	73.5	s., blk. sp	Abundant.
21567	U.S.N.M.	2						
21568	U.S.N.M.	2						
21569	U.S.N.M.	1	D2377	29 07 30 N.; 88 08 00 W	210	67	gy. m	Rare.
13097	J. A. C	2		Off Ragged Key, Fla	71			Do.
13098	J. A. C	1		do	75			Do.
21570	U.S.N.M.	1		Off Government Cut, Miami, Fla.	100			Do.
21571	U.S.N.M.	6		Off Ajax Reef, Fla	40			Few.
21572	U.S.N.M.	8		Off Fowey, Fla	22			Common.
21573	U.S.N.M.	8		do	40			Do.
13099	J. A. C	3		do	42			Rare.
21574	U.S.N.M.	10+		do	45			Abundant.
21575	U.S.N.M.	1		do	45			Do.
21576	U.S.N.M.	3		do	47			Rare.
13100	J. A. C	1		do	52			Do.
21577	U.S.N.M.	6		do	55			Few.
13101	J. A. C	1		do	55			Do.
2759	J. A. C	1	37	Dry Tortugas, Fla	11		fne. s	Rare.

CIBICIDES ROBERTSONIANA (H. B. Brady)

Plate 23, figures 6 *a–c*

Truncatulina robertsoniana H. B. Brady, Quart. Journn. Micr. Sci., vol. 21, 1881, p. 65; Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 664, pl. 95, figs. 4 *a–c*.—Egger, Abhandl. kön. bay. Akad. Wiss. München, Cl. II, vol. 18, 1893, p. 402, pl. 16, figs. 34–36.—Woodward, The Observer, vol. 4, 1893, p. 177.—Chapman, Proc. Zool. Soc. London, 1895, p. 40.—Flint, Ann. Rep't. U. S. Nat. Mus., 1897 (1899), p. 333, pl. 77, fig. 3.—Heron-Allen and Earland, Journ. Roy. Micr. Soc., 1909, p. 681.—Pearcey, Trans. Roy. Soc. Edinburgh, vol. 49, 1914, p. 1028.—Heron-Allen and

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[47] Trans. Zool. Soc., London, vol. 12, 1888, pl. 46, figs. 7 *a–c*.

Earland, Trans. Zool. Soc. London, vol. 20, 1915, p. 708.—Sidebottom, Journ. Roy. Micr. Soc., 1918, p. 256.—Heron-Allen and Earland, British Antarctic Exped. Zoology, vol. 6, 1922, p. 210.—Yabe and Hanzawa, Jap. Journ. Geol. Pal., vol. 4, 1925 (1926), p. 52.

Test unequally biconvex, dorsal side much flattened, dorsal side showing all the whorls, ventral side somewhat evolute, periphery bluntly angled; chambers very numerous, twelve to fifteen in the adult whorl, of uniform shape, increasing in size very gradually; sutures only slightly oblique on the dorsal side, more so on the ventral, only slightly depressed on the ventral side; wall smooth, very transparent so that all the chambers are visible to the center, especially from the dorsal side, very finely perforate; aperture at the periphery and extending slightly on both sides; color a rich brown.

Diameter up to nearly 1 mm.

This is a very distinctive species in its form and coloring. Its distribution seems to include other regions than the Atlantic, but it is characteristic of cool waters or waters of some considerable depth.

The wider spread form is not clearly made out, but some of the forms assigned to *Planulina* may be found to connect with this species.

Cibicides robertsoniana—Material examined

Cat. No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
			Albatross	° ′ ″ ° ′ ″				
21556	U.S.N.M.	3	D2039	38 19 26 N.; 68 20 20 W	2, 369	------	glob. oz	Rare.
21557	U.S.N.M.	2	D2042	39 33 00 N.; 68 26 45 W	1, 555	38. 5	glob. oz	Do.
21558	U.S.N.M.	10+	D2144	9 49 00 N.; 79 31 30 W	896	------	gn. m	Abundant.
21559	U.S.N.M.	1	D2150	13 34 45 N.; 81 21 10 W	382	45. 8	wh. crs. s	Rare.
21560	U.S.N.M.	3	D2355	20 56 48 N.; 86 27 00 W	399	------	yl. oz	Do.
21561	U.S.N.M.	4	D2381	28 05 00 N.; 87 56 15 W	1, 330	------	lt. br. m	Few.
21562	U.S.N.M.	4	D2714	38 22 00 N.; 70 17 30 W	1, 825	------	br. oz	Do.
21563	U.S.N.M.	3	D2751	16 54 00 N.; 63 12 00 W	687	40	bu. glob. oz	Rare.
21564	U.S.N.M.	1	D2761	15 39 00 S.; 38 32 54 W	818	39	pter. oz	Do.
21565	U.S.N.M.	4	D2763	24 17 00 S.; 42 48 30 W	671	37. 9	br. glob. oz	Few.

CIBICIDES FLORIDANA (Cushman)

Plate 23, figures 3–5

Truncatulina floridana Cushman, Bull. 676, U. S. Geol. Surv., 1918, p. 62, pl. 19, figs. 2 *a–c*.—Nuttall, Quart. Journ. Geol. Soc., vol. 84, 1928, p. 98, pl. 7, figs. 14, 16.

Cibicides floridana Cushman, Bull. 4, Fla. Geol. Survey, 1930, p. 61, pl. 12, figs. 3*a–c*.

Test biconvex to plano-convex, dorsal side normally the less convex, periphery usually subacute, at least in the early stages; chambers gradually increasing in size, of fairly uniform shape in each specimen, number in the coil variable in typical specimens, ten to twelve; sutures on the dorsal side usually limbate, oblique, not depressed except between the last few chambers, on the ventral side gently curved, somewhat limbate in the early stages, usually not so later, but somewhat depressed; wall on the dorsal side especially, very coarsely perforate, the sutures sometimes extending above the test on the dorsal side but usually to a very slight amount; aperture peripheral and extending along the inner margin of the chamber on the dorsal side, often with a thin lip.

This species was described originally from the Miocene, Choctawhatchee marl of Florida. Similar specimens are common living off the coast of Florida and in adjacent regions as figured here (pl. 23, figs. 3 to 5). A study of a large series of Atlantic specimens of forms that were assigned by Brady to "*Truncatulina akneriana*" and "*T. ungeriana*" in the *Challenger* Report together with topotype material of these d'Orbignyan species leaves a very peculiar situation. Such specimens as those figured by Brady do not at all fit the characters of d'Orbigny's species from the Vienna Basin Miocene from which area I have abundant specimens for study. A part of these forms may be included under the following species.

Cibicides floridana—Material examined

Cat. No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
			Albatross	° ′ ″ ° ′ ″				
21641	U.S.N.M.	1	D2037	38 53 00 N.; 69 23 30 W	1,731	38	glob. oz	Rare.
21642	U.S.N.M.	2	D2140	17 36 10 N.; 76 46 05 W	966	39.7	s	Do.
21643	U.S.N.M.	1	D2398	28 45 00 N.; 86 26 00 W	227	48.6	gy. m	Do.
21644	U.S.N.M.	1	D2544	40 01 45 N.; 70 24 00 W	131	47.7	gn. s., bk. sp.	Do.
21645	U.S.N.M.	2	----------	Off Government Cut, Miami, Fla.	30	------	--------------	Do.
13111	J.A.C.	1	----------	Off Sand Key, Fla	38	------	--------------	Do.
21646	U.S.N.M.	10+	----------	do	85	------	--------------	Abundant.
13112	J.A.C.	3	----------	Off Ragged Key, Fla	71	------	--------------	Rare.
21647	U.S.N.M.	1	----------	do	75	------	--------------	Do.
13113	J.A.C.	1	----------	do	75	------	--------------	Do.
21648	U.S.N.M.	7	----------	do	80	------	--------------	Common.
21649	U.S.N.M.	6	----------	Off Sambo Key, Fla	50	------	--------------	Few.
21650	U.S.N.M.	5	----------	Off Ajax Reef, Fla	40	------	--------------	Do.
13114	J.A.C.	1	----------	Off Key West, Fla	78	------	--------------	Rare.
13115	J.A.C.	5	----------	do	78	------	--------------	Do.
21651	U.S.N.M.	6	----------	do	65	------	--------------	Few.
21652	U.S.N.M.	1	----------	Off Fowey, Fla	100	------	--------------	Rare.

CIBICIDES PSEUDOUNGERIANA (Cushman)

Plate 22, figures 3–7

Truncatulina ungeriana H. B. Brady (not *Rotalina ungeriana* d'Orbigny 1826 and 1846), Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 664, pl. 94, figs. 9*a–c*.

Truncatulina pseudoungeriana Cushman, U. S. Geol. Surv., Prof. Paper 129–E, 1922, p. 97, pl. 20, fig. 9; 129–F, 1922, p. 136; 133, 1923, p. 40.

Test biconvex to plano-convex, periphery subacute to somewhat bluntly rounded; chambers generally nine to eleven in the adult whorl but the number very different in the megalospheric and microspheric forms; sutures distinct and usually limbate, often strongly so and frequently somewhat raised; wall coarsely perforate, especially on the dorsal side; aperture peripheral and extending along the inner dorsal margin of the chamber.

Diameter up to 1 mm. or more in the microspheric form.

This species was described from the Oligocene of the United States, and Brady's figures referred to it as noted above. It is very abundant in the *Albatross* dredgings off the eastern coast of the United States. The microspheric form becomes much spread out and *Planulina*-like, but the other characters are kept.

Cibicides pseudoungeriana—Material examined

Catalogue No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
			Albatross	° ′ ″ ° ′ ″				
21578	U.S.N.M.	10+	D2018	37 12 22 N.; 74 20 04 W	788	39	bu. m	Abundant.
21579	U.S.N.M.	1	D2035	39 26 16 N.; 70 02 37 W	1,362		glob. oz	Rare.
21580	U.S.N.M.	2	D2037	38 53 00 N.; 69 23 30 W	1,731	38	glob. oz	Do.
21581	U.S.N.M.	7	D2038	38 30 30 N.; 69 08 25 W	2,033		glob. oz	Common.
21582	U.S.N.M.	4	D2039	38 19 26 N.; 68 20 20 W	2,369		glob. oz	Few.
21583	U.S.N.M.	1	D2042	39 33 00 N.; 68 26 45 W	1,555	38.5	glob. oz	Rare.
21584	U.S.N.M.	2	D2052	39 40 05 N.; 69 21 25 W	1,098	45	glob. oz	Few.
21585	U.S.N.M.	2	D2105	37 50 00 N.; 73 03 50 W	1,395	41	glob. oz	Rare.
21586	U.S.N.M.	6	D2106	37 41 20 N.; 73 03 20 W	1,497	42.5	glob. oz	Few.
21587	U.S.N.M.	10+	D2138	17 44 05 N.; 75 39 00 W	23		co. brk. sh	Abundant.
21588	U.S.N.M.	1	D2140	17 36 10 N.; 76 46 05 W	966	39.7	s	Rare.
21589	U.S.N.M.	10+	D2189	39 49 30 N.; 70 26 00 W	600	39.7	gn. m., s	Abundant.
21590	U.S.N.M.	9	D2192	39 46 30 N.; 70 14 45 W	1,060	38.6	gy. oz	Common.
21591	U.S.N.M.	1	D2205	39 35 00 N.; 71 18 45 W	1,073	38.1	gy. oz	Rare.
21592	U.S.N.M.	8	D2208	39 33 00 N.; 71 16 15 W	1,178	38.4	gn. m	Common.
21593	U.S.N.M.	3	D2212	39 59 30 N.; 70 30 45 W	428	40	gn. m	Few.
21594	U.S.N.M.	3	D2226	37 00 00 N.; 71 54 00 W	2,045	36.8	glob. oz	Do.
21595	U.S.N.M.	2	D2234	39 09 00 N.; 72 03 15 W	810	38.6	gn. m	Rare.
21596	U.S.N.M.	5	D2262	39 54 45 N.; 69 29 45 W	250	41.6	gn. m., s	Common.
21597	U.S.N.M.	9	D2311	32 55 00 N.; 77 54 00 W	79	59.1	crs. s., bk. sp.	Do.
21598	U.S.N.M.	6	D2335	23 10 39 N.; 82 20 21 W	204			Few.
21599	U.S.N.M.	4	D2355	20 56 48 N.; 86 27 00 W	399		yl. oz	Do.
21600	U.S.N.M.	5	D2377	29 07 30 N.; 88 08 00 W	210	67	gy. m	Do.
21601	U.S.N.M.	1	D2395	28 36 15 N.; 86 50 00 W	347	44.1	gy. m	Rare.
21602	U.S.N.M.	10+	D2530	40 53 30 N.; 66 24 00 W	956	38.4	gy. oz	Abundant.
21603	U.S.N.M.	5	D2534	40 01 00 N.; 67 29 15 W	1,234	37.8	gy. oz	Few.
21604	U.S.N.M.	3	D2535	40 03 30 N.; 67 27 15 W	1,149	37.8	gy. oz	Rare.
21605	U.S.N.M.	3	D2542	40 00 15 N.; 70 42 20 W	129	47.2	s., brk. sh	Do.
21606	U.S.N.M.	1	D2544	40 01 45 N.; 70 24 00 W	131	47.7	gn. s., bk. sp.	Do.
21607	U.S.N.M.	10	D2550	39 44 30 N.; 70 30 45 W	1,081	38.5	br. m	Common.
21608	U.S.N.M.	10+	D2552	39 47 07 N.; 70 35 00 W	721	39.6	gy. oz	Abundant.
21609	U.S.N.M.	1	D2562	39 15 30 N.; 71 25 00 W	1,434	37.3	gy. oz	Common.
21610	U.S.N.M.	9						
21611	U.S.N.M.	2	D2563	39 18 30 N.; 71 23 30 W	1,422	37.4	gy. oz	Do.
21612	U.S.N.M.	5						
21613	U.S.N.M.	10+	D2564	39 22 00 N.; 71 23 30 W	1,390	37.3	gy. oz	Abundant.
21614	U.S.N.M.	1	D2570	39 54 00 N.; 67 05 30 W	1,813	36.8	glob. oz	Rare.
21615	U.S.N.M.	4	D2573	40 34 18 N.; 66 09 00 W	1,742	37.3	gy. m. s	Few.
21616	U.S.N.M.	3	D2585	39 08 30 N.; 72 17 00 W	542	39	dk. gy. m	Do.
21617	U.S.N.M.	2	D2586	39 02 40 N.; 72 40 00 W	328	40.2	dk. gy. m	Rare.
21618	U.S.N.M.	2	D2629	23 48 40 N.; 75 10 40 W	1,169	38.4	co. s	Do.
21619	U.S.N.M.	7	D2659	28 32 00 N.; 78 42 00 W	509	45.2	br. for	Common.
21620	U.S.N.M.	3	D2660	28 40 00 N.; 78 46 00 W	504	45.7	yl. for	Rare.
21621	U.S.N.M.	2	D2684	39 35 00 N.; 70 54 00 W	1,106		br. c., bk. sp.	Do.
21622	U.S.N.M.	1	D2689	39 42 00 N.; 71 15 30 W	525		gn. m	Do.
21623	U.S.N.M.	1	D2716	38 29 30 N.; 70 57 00 W	1,631		br. oz., for	Do.
21624	U.S.N.M.	10+	D2739	37 34 30 N.; 73 58 00 W	811	38.2	gy. m	Abundant.
21625	U.S.N.M.	10+	*Goldseeker*	61 34 00 N.; 2 4 00 E				Do.
21626	U.S.N.M.	10+	do	60 28 00 N.; 3 15 00 W				Do.
13107	J.A.C.	10+	do	58 44 00 N.; 7 00 00 W				Do.
21627	U.S.N.M.	10+						
13108	J.A.C.	10+	*Flying Fox.*	W. of Ireland	1,000			Do.
21628	U.S.N.M.	10+	*Goldseeker*	Off SW. Ireland	620–695			Do.

CIBICIDES PSEUDOUNGERIANA (Cushman), var. IO, new variety

Plate 23, figures 1, 2

Truncatulina tenera Flint (not H. B. Brady), Ann. Rep't. U. S. Nat. Mus., 1897 (1899), p. 334, pl. 77, fig. 4(?).

Variety differing from the typical in having the dorsal side with a flattened, much thickened area surrounded by a deep and conspicuous channel, the sutures very strongly limbate and raised, and the periphery usually more rounded.

Holotype of variety (Cat. No. 21640, U.S.N.M.), off Fowey Light, Fla., 40 fathoms.

This variety is often very abundant in the *Albatross* material from the northern part of the Gulf of Mexico, but was not found in the *Albatross* dredgings in the more northern colder waters. It is not common in the shallow water along the Florida coast. The microspheric form is much spread out, but keeps the central, flattened boss.

Cibicides pseudoungeriana, var. *io*—*Material examined.*

Cat. No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
			Albatross	° ′ ″ ° ′ ″				
21629	U.S.N.M.	1	D2140	17 36 10 N.; 76 46 05 W	966	39.7	s	Rare.
21630	U.S.N.M.	1	D2150	13 34 45 N.; 81 21 10 W	382	45.8	wh. crs. s	Do.
21631	U.S.N.M.	5	D2377	29 07 30 N.; 88 08 00 W	210	67	gy. m	Few.
21632	U.S.N.M.	2	D2381	28 05 00 N.; 87 56 15 W	1,330	------	lt. br. m	Rare.
21633	U.S.N.M.	10+	D2392	28 47 30 N.; 87 27 00 W	724	40.7	br. gy. m	Abundant.
21634	U.S.N.M.	1	D2393	28 43 00 N.; 87 14 30 W	525	41.1	lt. gy. m	Rare.
21635	U.S.N.M.	7	D2394	28 38 30 N.; 87 02 00 W	420	41.8	gn. m	Common.
21636	U.S.N.M.	2	D2395	28 36 15 N.; 86 50 00 W	347	44.1	gy. m	Rare.
21637	U.S.N.M.	1	D2398	28 45 00 N.; 86 26 00 W	227	48.6	gy. m	Do.
21638	U.S.N.M.	4	D2399	28 44 00 N.; 86 18 00 W	196	51.6	gy. m	Few.
21639	U.S.N.M.	10+	D2400	28 41 00 N.; 86 07 00 W	169	------	gy. m	Abundant.
21640	U.S.N.M.	1	------	Off Fowey, Fla	40	------	------	Rare.

CIBICIDES sp(?)

Plate 24, figures 1 *a–c*

There are numerous specimens which can not be placed in any of the above species. One of these is figured here and may be found to be of distinct character. It has no keel, and the two sides of the test are very much alike. It much resembles d'Orbigny's "*Truncatulina vermiculata*" from the coast of South America and the Falklands.

Genus DYOCIBICIDES Cushman and Valentine, 1930

Dyocibicides Cushman and Valentine, Contrib. Dept. Geol., Stanford University, vol. 1, No. 1, 1930, p. 30.

Genoholotype.—*Dyocibicides biserialis* Cushman and Valentine.

Test probably attached in the young, trochoid, plano-convex, ventral side convex, dorsal side flattened, close coiled; the chambers in the later development becoming biserial and rapidly enlarging; wall calcareous, coarsely perforate; aperture in the early stages peripheral or extending slightly to the dorsal side, in the adult an elongate, open slit at the outer end of the chambers, with a lip.

This is a genus derived from *Cibicides*, in which the later development departs from the close coiled character usual in this family, and becomes definitely biserial. It is found widely distributed in both the Pacific and Atlantic, and is found fossil in the Miocene of Florida and probably elsewhere.

The genus has many parallelisms in the other groups of the Foraminifera, such as *Spiroplectammina*, *Heterohelix*, and *Spiroplectoides*, and especially *Mooreinella* in the Trochamminidae, which has also a trochoid young stage and becomes biserial later.

DYOCIBICIDES BISERIALIS Cushman and Valentine

Plate 24, figure 2

Dyocibicides biserialis Cushman and Valentine, Contrib. Dept. Geology, Stanford University, vol. 1, No. 1, 1930, p. 31, pl. 10, figs. 1, 2.—Cushman, Bull. 4, Florida Geol. Surv., 1930, p. 62, pl. 12, figs. 6 *a*, *b*.

Truncatulina variabilis H. B. Brady, Parker, and Jones (not d'Orbigny), Trans. Zool. Soc. London, vol. 12, 1888, p. 227, pl. 45, fig. 17.

Test very much compressed throughout, periphery subacute, the early portion close coiled, trochoid, later chambers becoming biserial; chambers very slightly inflated, distinct, 7 to 8 in the last whorl of the coiled portion; sutures very distinct, on the dorsal side of the coiled portion limbate and flush with the surface, others depressed, not limbate as are all those of the ventral side; wall finely, evenly, and conspicuously perforate, otherwise smooth; aperture nearly peripheral in the early portion, becoming terminal in the biserial portion.

Measurements of type specimen: Length, 0.90 mm.; breadth, 0.60 mm.; thickness, 0.20 mm.

There is a single specimen in the collections studied which is figured here. It is from *Albatross* Station D2416, off Georgia in 276 fathoms. Brady, Parker, and Jones had it from the Abrohlos Bank off Brazil. The specimen has evidently been worn and smoothed, possibly by the digestive acids of a fish or holothurian. It is identical with the California material and that from the Miocene of the Choctawhatchee marl of Florida.

Some of the specimens assigned to "*Truncatulina variabilis*" may belong here, but it is very different from the type of d'Orbigny's species in the Canaries report.

Dyocibicides biserialis—Material examined

Cat. No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
			Albatross	° ′ ″ ° ′ ″				
21660	U.S.N.M.	1	D2416	31 26 00 N.; 79 07 00 W	276	53.8	co., brk. sh.	Rare.
21661	U.S.N.M.	1	D2756	3 22 00 S.; 37 49 00 W	417	40.5	gy. sp	Do.
13121	J.A.C.	1		Off Plymouth, England				Do.

Genus CIBICIDELLA Cushman, 1927

Cibicidella Cushman, Contr. Cushman Lab. Foram. Res., vol. 3, 1927, p. 93; Special Publ. No. 1, Cushman Lab. Foram. Res., 1928, p. 323.
Truncatulina (part) of Authors.
Planorbulina (part) Egger, 1857 (not d'Orbigny).

Genoholotype.—Truncatulina variabilis d'Orbigny.

Test attached by the flattened dorsal side, in the early stages similar to *Cibicides*, later chambers irregularly disposed; wall calcareous, coarsely perforate; aperture in the early stages as in *Cibicides*, in the adult, rounded, on the dorsal side with a short neck and distinct lip.

Recent.

CIBICIDELLA VARIABILIS (d'Orbigny)

Plate 24, figure 3

Truncatulina variabilis d'Orbigny, in Barker Webb and Berthelot, Hist. Nat. Iles Canaries, 1839, vol. 2, pt. 2, "Foraminifères," p. 135, pl. 2, fig. 29.

The test in the early stages is apparently like *Cibicides*, but the later chambers become much irregular and are uncoiled in an irregularly linear series.

There are many later records for this species, but with very few exceptions no figures are given, and most of these show entirely different things from that figured by d'Orbigny. The types were from the Canaries.

Genus CYCLOCIBICIDES Cushman, 1927

Cyclocibicides Cushman, Contr. Cushman Lab. Foram. Res., vol. 3, 1927, p. 93; Special Publ. No. 1, Cushman Lab. Foram. Res., 1928, p. 323.
Planorbulina (part) of Authors.
Rotalia Jones and Parker, 1860 (not Lamarck).
Pulvinulina (part) of Authors.
Planopulvinulina (part) Schubert, Pal. Zeitschr., vol. 3, 1920, p. 153.

Genoholotype.—Planorbulina vermiculata d'Orbigny.

Test attached, in the early stages similar to *Cibicides*, the chambers elongating in later growth and becoming nearly or completely annular; wall calcareous, coarsely perforate; aperture in the early stages as in *Cibicides*, in the adult formed by the numerous large pores scattered over the surface.

Recent.

CYCLOCIBICIDES VERMICULATA (d'Orbigny)

This is a common Mediterranean species, but the only Atlantic records are those of Heron-Allen and Earland from off Selsey Bill, England, and a single record from the Clare Island region.

Genus WEBBINA d'Orbigny, 1839

Webbina D'ORBIGNY, in Barker Webb and Berthelot, Hist. Nat. Iles Canaries, 1839, vol. 2, pt. 2, "Foraminifères," p. 125.—CUSHMAN, Special Publ. No. 1, Cushman Lab. Foram. Res., 1928, p. 324.

Webbum RHUMBLER, Foram. Plankton Exped., pt. 2, 1913, p. 445 (genotype, by designation, *Webbina rugosa* d'Orbigny).

Genoholotype.—Webbina rugosa d'Orbigny.

Test attached, consisting of a few chambers with a neck and circular aperture with a slight lip, the wall calcareous and perforate.

Tertiary and Recent.

WEBBINA RUGOSA d'Orbigny

Plate 24, figures 4 *a–c*

Webbina rugosa D'ORBIGNY, in Barker Webb and Berthelot, Hist. Nat. Iles Canaries, 1839, vol. 2, pt. 2, "Foraminifères," p. 126, pl. 1, figs. 16–18.

A figure is given of d'Orbigny's type from the Canary Islands. It is an attached flattened form with a rugose surface, and in the uncoiled adult has a terminal aperture, rounded and with a lip.

Webbina rugosa—Material examined

Catalogue No.	Collection of	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
13132	J.A.C.	2	------	Montego Bay, Jamaica----------	-------	------	-------------	Rare.

Family 42. PLANORBULINIDAE

Test, in the early stages, coiled, attached by the dorsal surface, chambers in a spiral arrangement, apertures single, later with the chambers added in annular series, the apertures usually two to a chamber, the test free and becoming bilaterally symmetrical, not developing pillars.

The genera in this family are closely related to and undoubtedly derived from the Anomalinidae. This relationship in the free forms is only seen in the study of the early stages which are mostly attached. From the more complex genera such as *Planorbulinella* and *Linderina*, it is but a simple step to the genera of the Orbitoididae.

The living species are mostly in the Indo-Pacific at the present time, but in the Tertiary were more widely distributed.

Genus PLANORBULINA d'Orbigny, 1826

Planorbulina d'Orbigny, Ann. Sci. Nat., vol. 7, 1826, p. 280.—H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 655.—Chapman, The Foraminifera, 1902, p. 218.—Cushman, Smithsonian Misc. Coll., vol. 77, No. 4, 1925, p. 44; Special Publ. No. 1, Cushman Lab. Foram. Res., 1928, p. 326.

Asterodiscus Ehrenberg, Abhandl. k. Akad. Wiss. Berlin, 1838, p. 130 (genoholotype, *Asterodiscus forskålii* Ehrenberg).

Spirobotrys Ehrenberg, Bericht. k. preuss. Akad. Wiss. Berlin, 1844, p. 247 (genoholotype, *Spirobotrys aegaea* Ehrenberg).

Soldanina Costa, Atti Accad. Pont., vol. 7, fasc. 2, 1856, p. 246 (genoholotype, *Soldanina exagona* Costa).

Genotype, by designation.—*Planorbulina mediterranensis* d'Orbigny.

Test in the young, coiled, attached by the dorsal surface, very earliest chambers slightly trochoid, closely spiral, later in an irregular series of a single layer about the periphery; wall calcareous, coarsely perforate; apertures in the early stages one to each chamber, near the periphery or in the irregular chambers sometimes multiple.

Tertiary and Recent.

PLANORBULINA MEDITERRANENSIS d'Orbigny

Plate 24, figures 5–8

Planorbulina mediterranensis d'Orbigny, Ann. Sci. Nat., vol. 7, 1826, p. 280, No. 2, pl. 14, figs. 4–6; Modèles, No. 79, 1826; Foram. Foss. Bass. Tert. Vienne, 1846, p. 166, pl. 9, figs. 15–17.—H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 656, pl. 92, figs. 1–3.—H. B. Brady, Parker, and Jones, Trans. Zool. Soc., London, vol. 12, 1888, p. 227, pl. 45, fig. 18.—Woodward, The Observer, 1893, p. 176.—Goës, Kongl. Svensk. Vet. Akad. Handl., vol. 25, No. 9, 1894, p. 91, pl. 15, fig. 786; Bull. Mus. Comp. Zoöl., vol. 29, 1896, p. 73.—Flint, Rep't. U. S. Nat. Mus., 1897 (1899), p. 328, pl. 72, fig. 6.—Cushman, Publ. 311, Carnegie Instit., Washington, 1922, p. 45, pl. 6, figs. 1, 2; Publ. 344, 1926, p. 78. —Heron-Allen and Earland, Journ. Roy. Micr. Soc., 1930, p. 186.

Test adherent, flattened; early chambers distinctly spiral, later ones less so, often irregularly annular in their arrangement, more or less lobulated on the ventral face; periphery irregular, often angular; wall very conspicuously perforated; early chambers usually with a brownish color, later chambers grayish-white; sutures depressed, often clearly marked on the dorsal face by a distinct band of shell material; apertures at either side of the chamber in the adult, simple, each with a raised lip.

Diameter up to 1 mm.

Outside of d'Orbigny's records I have given only those references that pertain to the western Atlantic. The records for this species cover most of the oceans, and further study may show these to belong to different species. It is well distributed in the western Atlantic from the coast of Florida through the West Indies to Brazil. There are very many records for it on the eastern side of the Atlantic from the coasts of Norway to Spain and West Africa and the Mediterranean, as well as the Indo-Pacific. The early chambers have a distinct spiral tendency. The later development is irregular, but the periphery is usually well rounded and typically entire.

Flint's specimens referred to *Gypsina inhaerens* probably belong here.

Planorbulina mediterranensis—Material examined

Catalogue No.	Collection of	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
			Albatross	° ′ ″ ° ′ ″				
21662	U.S.N.M.	2	D2318	24 25 45 N.; 81 46 00 W	45	75.	co	Rare.
21663	U.S.N.M.	1	D2388	29 24 30 N.; 88 01 00 W	35		yl. s., bk. sp.	Do.
21664	U.S.N.M.	5	D2641	25 11 30 N.; 80 10 00 W	60	69. 2	co. s	Few.
13121	J. A. C.	2		Off Miami, Fla	6			Rare.
13122	J. A. C.	2		Off Ragged Key, Fla	75			Do.
21665	U.S.N.M.	1		do	70			Do.
21666	U.S.N.M.	5		do	85			Few.
21667	U.S.N.M.	1		Off Ajax Reef, Fla	40			Rare.
21668	U.S.N.M.	1		Off Fowey, Fla	22			Do.
21669	U.S.N.M.	1		do	28			Do.
21670	U.S.N.M.	2		do	45			Do.
13123	J. A. C.	3		do	52			Do.
13124	J. A. C.	10		do	55			Common.
13125	J. A. C.	1		do	55			Do.
13126	J. A. C.	6		do	60			Few.
21671	U.S.N.M.	10+		do	70			Abundant.
21672	U.S.N.M.	3		do	70			Do.
21673	U.S.N.M.	1		do	70			Do.
2837	J. A. C.	2	42	Dry Tortugas, Fla	18		s	Rare.
2838	J. A. C.	1		Bermuda				Do.
2840	J. A. C.	1	1	San Juan Harbor. P. R	5			Do.
2839	J. A. C.	1	4	do	1			Few
13127	J. A. C.	2	*Flying Falcon* log. 8	10 mi. S. of Glencoe. Ireland.	53			Rare.
13128	J. A. C.	5	*Lord Bandon* log. 33	Nymph Bank, S. of Cork Harbor, Ireland.	52. 5			Few.
13129	J. A. C.	7	log. 42	Off Bantry Bay, S. W. Ireland.	37. 5			Do.
13130	J. A. C.	10+		Off Plymouth, England				Abundant.

PLANORBULINA ACERVALIS H. B. Brady

Plate 25, figures 1 *a*, *b*

Planorbulina acervalis H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 657, pl. 92, fig. 4.—H. B. Brady, Parker, and Jones, Trans. Zool. Soc., London, vol. 12, 1888, p. 227, pl. 46, fig. 11.—Chapman, Proc. Zool. Soc., London, 1895, p. 39.—Flint, Rep't. U. S. Nat. Mus., 1897(1899), p. 328, pl. 72, fig. 7.—Chapman, Journ. Linn. Soc. Zool., vol. 28, 1902, p. 382.—Millett, Journ. Roy. Micr. Soc., 1904, p. 490.—Rhumbler, Zool. Jahrb., Abteil. Syst., vol. 24, 1906, p. 67.—Sidebottom, Mem. Proc. Manchester Lit. Philos. Soc., vol. 53, No. 21, 1909,

p. 2, pl. 1, fig. 4; vol. 54, No. 16, 1910, p. 27.—CUSHMAN, Bull. 71, U. S. Nat. Mus., pt. 5, 1915, p. 29, pl. 14, fig. 1.—HERON-ALLEN and EARLAND, Trans. Zool. Soc. London, vol. 20, 1915, p. 705.—CUSHMAN, Proc. U. S. Nat. Mus., vol. 56, 1919, p. 627; Bull. 100, vol. 4, 1921, p. 311; vol. 59, 1921, p. 55, pl. 12, fig. 8.—HERON-ALLEN and EARLAND, Bull. Soc. Sci. Hist. Nat. Corse, 1922, p. 137; British Antarctic Exped., Zool., vol. 6, 1922, p. 207.—CUSHMAN, Publ. 311, Carnegie Instit., Washington, 1922, p. 45, pl. 6, fig. 3; Publ. 342, 1924, p. 37.

Test typically adherent, composed of numerous chambers, early ones spiral, later ones irregularly annular, those of the periphery lobulated, the newly added chambers extending outward a considerable distance beyond the preceding ones; ventral surface often covered by a mass of small acervuline chambers; wall conspicuously porous; apertures lipped.

Diameter of western Atlantic specimens up to 3 mm.

There seems to be much question as to the actual identification of d'Orbigny's *P. vulgaris* of the Cuban Monograph. A discussion of this given in the paper on Jamaica is repeated here, as well as the notes made on the Tortugas specimens.

Typical *P. mediterranensis* is now definitely known from the West Indian region in shallow water. Goës, in 1882, records and figures two forms under the name *Planorbulina farcta*, var. *vulgaris*, of which figure 227 seems most like *P. mediterranensis* or *P. vulgaris*. Figure 226, however, is *P. acervalis* H. B. Brady without any doubt. These were both from the Caribbean. In 1896 Goës records *Planorbulina* again from the Caribbean as *P. mediterranensis* and places his earlier *P. farcta*, var. *vulgaris* as a synonym, but figure 226 as *P. acervalis*, as noted above. Goës gives the following not very clear note (p. 74):

"A pygmy form of this species is not seldom met with in the Caribbean Sea in 300 fathoms of water. A variety of higher development that Brady has described under a separate denomination (*P. acervalis*) is also joined with the type, but of more rare occurrence."

As both forms occur together, and one is a "pygmy form," it is possible that this is but the young of *P. acervalis*. Flint[48] records both species from the Gulf of Mexico, a single specimen of *P. mediterranensis* from *Albatross* Station D2377, and *P. acervalis* from D2399 (number of specimens not given). The diameter of the former is given as 1 mm., that of the latter 1.5 to 2.5 mm. The specimen given as *P. mediterranensis* is evidently broken, from the evidence of the figure. The accumulative evidence then shows that *P. acervalis* is abundant in the West Indies and *P. mediterranensis* very rare or of doubtful occurrence.

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[48] Ann. Rep't. U. S. Nat. Mus., 1897(1899), p. 328.

Therefore it might seem from the incomplete evidence that d'Orbigny's *P. vulgaris* might possibly be the same as *P. acervalis* of Brady, and if so, would necessarily be used instead of *acervalis* for this species. The only means of really settling the problem would be the examination of the type specimens of *P. vulgaris* if they are extant, but the problem is here raised for consideration.

The original figures of this species given by d'Orbigny show an irregularly spiral test not unlike that figured in the Cuban monograph as *P. vulgaris*. The specimens, however, are not as regular as that figured by d'Orbigny, but they show a distinct spiral tendency that is evidently not the same as the one referred here to *P. acervalis*. Such specimens are similar to the figure given by Goës,[49] which he referred in 1896 to *P. mediterranensis* instead of *P. farcta*, var. *vulgaris*, the name used in 1882. This species is far less common than *P. acervalis* in the region, occurring at but one station, and there rarely.

It has not been possible to solve this problem further than given above. More material is available, but the type specimen of *P. vulgaris* must be seen if it is still extant. This will easily settle the problem.

In material from off the coast of Florida and elsewhere, there is a tendency for certain specimens to become built up on both sides, and to assume the condition usually seen in *Acervulina*.

Planorbulina acervalis—Material examined

Catalogue No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
21674	U. S. N. M.	7	------	Off Biscayne Bay, Fla	16–34	------	------	Common.
13131	J. A. C.	2	------	Off Key West, Fla	------	------	------	Rare.
2820	J. A. C.	1	4	Dry Tortugas, Fla	1	------	dead coral	Do.
2817	J. A. C.	3	13	do	11	------	fne. s	Do.
2816	J. A. C.	1	14	do	12	------	fne. s	Do.
2815	J. A. C.	2	19	do	5.75	------	fne. s	Do.
2818	J. A. C.	2	21	do	6	------	fne. s	Do.
2824	J. A. C.	1	22	do	6	------	fne. s	Common.
2822	J. A. C.	7	22	do	6	------	fne. s	Do.
2814	J. A. C.	1	27	do	7	------	m	Rare.
2819	J. A. C.	1	28	do	4.75	------	fne. s	Do.
12934	J. A. C.	1	------	Bermuda	------	------	------	Do.
2825	J. A. C.	4	------	Bogue Islands, Montego Bay, Jamaica.	1	------	m	Few.

Genus PLANORBULINOIDES Cushman, 1928

Planorbulinoides CUSHMAN, Contr. Cushman Lab. Foram. Res., vol. 4, 1928, p. 6; Special Publ. No. 1, 1928, p. 327.

Planorbulina (part) PARKER and JONES, 1865.

Genoholotype.—Planorbulina retinaculata Parker and Jones.

Test attached, in the early stages similar to *Planorbulina* but the later chambers spreading, becoming elongate and more or less separated to form a network; apertures in the early stages as in *Planorbulina*, later several on the sides of the chambers, with very short necks.

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[49] Kongl. Svensk. Vet. Akad. Handl., vol. 19, No. 4, 1882, pl. 97, fig. 227.

Recent.

This genus is confined to shallow warm waters of the Indo-Pacific.

Genus PLANORBULINELLA Cushman, 1927

Planorbulinella Cushman, Contr. Cushman Lab. Foram. Res., vol. 3, 1927, p. 96; Special Publ. No. 1, 1928, p. 327.
Planorbulina (part) of Authors.

Genoholotype.—Planorbulina larvata Parker and Jones.

Test in the adult nearly bilaterally symmetrical, in the young attached and like *Planorbulina*, soon having the chambers developed about the periphery in annular series, the chambers of each series alternating with those of the adjacent ones; wall calcareous, coarsely perforate; apertures in the adult, two, one at each side of the chamber in the median line.

Tertiary and Recent.

This genus is only known from the Indo-Pacific in the living state. In the Tertiary it had a much wider distribution and more complex species.

Genus LINDERINA Schlumberger, 1893

Linderina Schlumberger, Bull. Soc. Géol. France, sér. 3, vol. 21, 1893, p. 120.—Cushman, Special Publ. No. 1, Cushman Lab. Foram. Res., 1928, p. 328.

Genoholotype.—Linderina brugesi Schlumberger.

Test similar to *Planorbulinella* with annular series of chambers, but developing a thick layer of clear shell material over the central portion of the test on the two flattened sides; wall calcareous, coarsely perforate; apertures in the adult formed by the coarse perforations of the peripheral border.

Upper Eocene.

Genus ACERVULINA Schultze, 1854

Acervulina Schultze, Organ. Polythal., 1854, p. 67.—Cushman, Special Publ. No. 1, Cushman Lab. Foram. Res., 1928, p. 328.

Genotype, by designation.—*Acervulina inhaerens* Schultze.

Test attached by the dorsal side, at least in the early stages, if attached to a small object often entirely covering it and then covering its own early chambers, earliest chambers coiled; wall calcareous, coarsely perforate; apertures formed by the coarse perforations of the test.

Late Tertiary and Recent.

Under this generic name are placed those adherent species which form more or less plate-like encrustations and become irregular in form.

ACERVULINA INHAERENS Schultze

Plate 25, figures 2 *a–c*

Acervulina inhaerens Schultze, Organ. Polythal., 1854, p. 68, pl. 6, figs. 13, 14.—Fornasini, Mem. Accad. Sci. Istit. Bologna, ser. 5, vol. 8, 1900, p. 42.—Galloway and Wissler, Journ. Pal., vol. 1, 1927, p. 67, pl. 11, fig. 3.

Gypsina inhaerens H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 718, pl. 102, figs. 1–6.—Balkwill and Wright, Trans. Roy. Irish Acad., vol. 28, Sci., 1885, p. 352.—Siddall, Proc. Lit. Philos. Soc. Liverpool, 1886, p. 71.—H. B. Brady, Parker, and Jones, Trans. Zool. Soc., London, vol. 12, 1888, p. 229, pl. 41, fig. 19.—Halkyard, Trans. Manchester Micr. Soc., 1889, p. 71.—Howchin, Trans. Proc. Roy. Soc. So. Australia, vol. 12, 1889, p. 14.—Chaster, First Rep't. Southport Soc. Nat. Sci., 1890–91 (1892), p. 66.—Wright, Proc. Roy. Irish Acad., ser. 3, vol. 1, 1891, p. 492.—Goës, Kongl. Svensk. Vet. Akad. Handl., vol. 25, No. 9, 1894, p. 91, pl. 15, fig. 787.—Kiaer, Rep't. Norwegian Fish. and Mar. Invest., vol. 1, No. 7, 1900, p. 48.—Wright, Irish Nat., 1900, p. 55.—Chapman, Journ. Linn. Soc. Zool., vol. 28, 1902, pp. 198, 209, 407.—Millett, Journ. Roy. Micr. Soc., 1904, p. 599.—Earland, Journ. Quekett Micr. Club, 1905, p. 228.—Dakin, Rep't. Pearl Oyster Fish Ceylon, 1906, p. 240.—Rhumbler, Zool. Jahrb., Abt. Syst., vol. 24, 1906, p. 72, pl. 5, fig. 60.—Chapman, Journ. Quekett Micr. Club, ser. 2, vol. 10, 1907, p. 140.—Millett, Rec. Foram. Galway, 1908, p. 7.—Chapman, Subantarctic Islands of New Zealand, 1909, p. 363.—Heron-Allen and Earland, Journ. Roy. Micr. Soc., 1909, p. 691.—Sidebottom, Mem. Proc. Manchester Lit. Philos. Soc., vol. 53, No. 21, 1909, p. 11.—Schubert, Abhandl. geol. Reichs., vol. 20, pt. 4, 1911, p. 115, pl. 3, fig. 3.—Heron-Allen and Earland, Proc. Roy. Irish Acad., vol. 31, pt. 64, 1913, p. 141; Trans. Zool. Soc. London, vol. 20, 1915, p. 724.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 5, 1915, p. 74, pl. 21, figs. 6, 7.—Heron-Allen and Earland, Trans. Linn. Soc. London, ser. 2, vol. 11, 1916, p. 278; Journ. Roy. Micr. Soc., 1916, p. 53.—Halkyard, Mem. Proc. Manchester Lit. Philos. Soc., vol. 62, pt. 2, 1918 (1919), p. 115.—Cushman, Proc. U. S. Nat. Mus., vol. 56, 1919, p. 631; Publ. 291, Carnegie Instit., Washington, 1919, p. 43.—Martinotti, Atti Soc. Ital. Sci. Nat., vol. 59, 1920, p. 334.—Heron-Allen and Earland, Bull. Soc. Sci. Hist. Nat. Corse, 1922, p. 139; British Antarctic Exped., Zool., vol. 6, 1922, p. 221; Journ. Roy. Micr. Soc., 1924, p. 183; Journ. Linn. Soc. Zool., vol. 35, 1924, p. 637, pl. 37, figs. 62–64; Trans. Zool. Soc. London, vol. 22, pt. 1, 1926, p. 70.—Hanzawa, Jap. Journ. Geol. Pal., vol. 4, 1925 (1926), p. 44.—Koch, Ber. Schweiz. Pal. Ges., vol. 19, 1926, p. 728.

Test typically attached, with the earliest chambers coiled, quickly followed by chambers in an irregular grouping rapidly covering the early chambers, often with several layers; wall coarsely perforate forming the apertures.

The chambers conform to the general surface to which they are attached. When the object is small, the chambers may completely envelope it, or if small and cylindrical, they may group themselves variously about it. If the surface of attachment is flat, the chambers form a broad, generally flattened test.

Such specimens are often very numerous in parts of the general West Indian region, and have already been noted under *Planorbulina acervalis*.

Acervulina inhaerens.—Material examined

Catalogue No.	Collection of—	Number of specimems	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
21677	U.S.N.M.	2	*Goldseeker*	58° 44′ 00″ N.; 5° 00′ 00″ W.				Rare.
21678	U.S.N.M.	2	do	Off Nose Head, Moray Firth.				Do.
21679	U.S.N.M.	5	do	North Sound, Orkney Islands.				Few.
13137	J.A.C.	3		Croquet Id. Anchorage, Norway.	10			Rare.

Genus GYPSINA Carter, 1877

Gypsina Carter, Ann. Mag. Nat. Hist., ser. 4, vol. 20, 1877, p. 173.—Cushman, Special Publ. No. 1, Cushman Lab. Foram. Res., 1928, p. 330.

Orbitolina (part) of Authors.

Tinoporus (part) of Authors.

Ceriopora (part) of Authors.

Genotype, by designation.—*Orbitolina vesicularis* Parker and Jones.

Test, a generally spherical mass of compressed chambers, sometimes arranged in more or less radial rows; apertures formed by the coarse pores of the wall.

Cretaceous to Recent.

Typical species occur in the Indo-Pacific at the present time, but were widely distributed and of large size in the Tertiary.

GYPSINA VESICULARIS (Parker and Jones)

Orbitolina vesicularis Parker and Jones, Ann. Mag. Nat. Hist., ser. 3, vol. 6, 1860, p. 31, No. 5.

Gypsina vesicularis Carter, Ann. Mag. Nat. Hist., ser. 4, vol. 20, 1877, p. 173.—H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 718, pl. 101, figs. 9–12.—Balkwill and Wright, Trans. Roy. Irish Acad., vol. 28, Sci., 1885, p. 352.—Kiaer, Rep't. Norwegian Fish. and Mar. Invest., vol. 1, No. 7, 1900, p. 48.—Wright, Irish Nat., 1900, p. 55.—Millett, Rec. Foram. Galway, 1908, p. 7.—Heron-Allen and Earland, Proc. Roy. Irish Acad., vol. 31, pt. 64, 1913, p. 140, pl. 13, fig. 11; Trans. Linn. Soc. London, ser. 2, vol. 11, 1916, p. 278.

The above records are Atlantic ones for this species. I have found very few specimens in the *Albatross* and other material from the western Atlantic. The following notes are from Heron-Allen and Earland in regard to their Clare Island material from the coast of Ireland.

"This species occurs at a great many stations (20 at least), both in shoresands and dredgings, and in such variety as to present great difficulties in its identification as between *G. vesicularis* and *G. globulus*. Brady, in his 'Challenger' Report (FC), has referred to the confusion which exists between these two types. It seems questionable whether there is any real specific difference existing between them; but for purposes of convenience it is desirable to separate the small truly globular and solid specimens (which are also characterized by smaller vesicular chambers) under the name of *G. globulus*, and to assign to *G. vesicularis* the larger and coarser forms, whether their shape be compressed, convex, or biconvex, or even sub-spherical, as is frequently the case. These sub-spherical specimens really constitute the greatest difficulty, for they are practically indistinguishable from *G. globulus* except by their larger size and coarser areolation; but when regarded from the point of view of an extensive series of specimens, such as can be obtained at many stations in the area of the Clare Island Survey, the difficulty of discrimination is diminished by the fact that globular specimens of intermediate size are seldom or never found. *G. vesicularis* appears to begin its growth as a convex boss with a flat base, becoming first lenticular, and subsequently, in the largest specimens, almost truly spherical, whereas *G. globulus* begins with a minute spherical test, and increases in size by the addition of concentric layers. We figure an interesting variety of *G. vesicularis*, specimens of which have been found at many stations, in which the sub-globular test is a mere hollow shell. This variety presumably has its origin as an encrusting layer over some rounded and perishable body such as the terminal joint of a coralline. It is difficult to conceive in what other circumstances this peculiar form can have been assumed. The interior chambers of the sphere are always in a good state of preservation, showing no signs of erosion. Although we have not observed British specimens of *G. vesicularis* in the sessile condition, we have no doubt that the animal frequently assumes this habit, as many individuals are to be found in which the flattened base corresponds in moulding to the shape of molluscan fragments such as are common in the material." Their figures are reproduced here.

Gypsina vesicularis—Material examined

Catalogue No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
21675	U.S.N.M.	2	*Albatross* D2388	° ′ ″ ° ′ ″ 29 24 30 N.; 88 01 00 W	35		yl. s., bk. sp.	Rare.
12933	J.A.C.	1		Bermuda				Do.
2821	J.A.C.	1	12	Dry Tortugas, Fla	7	23° C	hrd	Do.
2823	J.A.C.	1	18	do	7		fne. s	Do.
21676	U.S.N.M.	1		Off Government Cut, Miami, Fla.	30			Do.
13133	J.A.C.	1		Off Key West, Fla	78			Do.
13134	J.A.C.	1		Off Fowey, Fla	47			Do.
13135	J.A.C.	1		Off Andros Id., Bahamas				Do.
13136	J.A.C.	1		Montego Bay, Jamaica				Do.

GYPSINA VESICULARIS (Parker and Jones), var. DISCA Goës

Gypsina vesicularis (Parker and Jones), var. *discus* Goës, Bull. Mus. Comp. Zoöl., vol. 29, 1896, p. 74, pl. 7, figs. 4–6.

Under this name Goës has figured and described forms from the Caribbean which have a biconvex form with rounded periphery.

Under the same name, Chapman and Heron-Allen and Earland have recorded specimens from the Indo-Pacific.

Goës also records subglobular specimens from off Scandinavia as variety *intermedia* Goës.

"GYPSINA GLOBULUS Reuss"

Under this name there are several Atlantic records of globular forms from the Abrohlos Bank off Brazil and from the coasts of Europe. Whether or not these are really the same as the fossil species described by Reuss may be doubted. In the Indo-Pacific such specimens are much larger, and in the Tertiary some of them become relatively very large.

Gypsina globulus—Material examined

Catalogue No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
			Albatross	° ′ ″ ° ′ ″				
21680	U.S.N.M.	1	D2758	6 59 00 S.; 34 47 00 W	20	79	brk. sh	Rare.
13138	J.A.C.	1		Off Fowey, Fla	55			Do.

GPYSINA RUBRA (d'Orbigny)

Planorbulina rubra d'Orbigny, Ann. Sci. Nat., vol. 7, 1826, p. 280, No. 4.—Fornasini, Mem. Accad. Sci. Istit. Bologna, ser. 6, vol. 5, 1908, p. 44, pl. 2, fig. 3.

Gypsina rubra Heron-Allen and Earland, Trans. Zool. Soc. London, vol. 20, 1915, p. 725, pl. 53, figs. 35–37.

Heron-Allen and Earland have examined d'Orbigny's type and have given copious notes in the reference given above. Our specimens from a single *Albatross* Station D2619 give a distinct record for this part of the Atlantic, while most of the records are from the Indo-Pacific.

Our specimens have the pinkish or rose-color characteristic of the species and the general form and surface characteristics shown by Heron-Allen and Earland in their figures. The specimens are attached to fragments of shells, and might easily have been overlooked.

Gypsina rubra—Material examined

Catalogue No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
			Albatross	° ′ ″ ° ′ ″				
21681	U.S.N.M.	5	D2619	33 38 00 N.; 77 36 00 W	15		crs. yl. s	Few.

Family 43. RUPERTIIDAE

Test in the early stages, trochoid, attached by the dorsal side as in *Cibicides*, later extending upward from the base of attachment still keeping a loose spiral; wall calcareous, coarsely perforate; aperture either at the inner margin of the chamber or becoming terminal and rounded, often with a neck and lip.

There are but three genera in this family, *Rupertia* known from the Tertiary and the present oceans, *Carpenteria* ranging from the Cretaceous to Recent, and *Eorupertia* known only from the Eocene of Japan. They form a specialized group evidently derived from the Anomalinidae from such forms as *Cibicides* by an upward extension of the later chambers, the general spiral character kept in most species, but in some species of *Carpenteria* becoming very irregular and almost uniserial.

Genus RUPERTIA Wallich, 1877

Rupertia Wallich, Ann. Mag. Nat. Hist., ser. 4, vol. 19, 1877, p. 502.—H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 680.—Chapman, The Foraminifera, 1902, p. 222.—Cushman, Smithsonian Misc. Coll., vol. 77, No. 4, 1925, p. 45; Special Publ. No. 1, Cushman Lab. Foram. Res., 1928, p. 330.

Genoholotype.—Rupertia stabilis Wallich.

Test attached, in the young, trochoid, the chambers later extending upward from the base of attachment still keeping a loose spiral; wall calcareous, thick, coarsely perforate; aperture in the early stages narrow, at the base of the chamber, in later development becoming much more open, rounded, and with a thickened, rounded lip.

This genus is represented in the Atlantic by the single species which follows.

RUPERTIA STABILIS Wallich

Plate 25, figures 3–9

Rupertia stabilis Wallich, Ann. Mag. Nat. Hist., ser. 4, vol. 19, 1877, p. 502, pl. 20, figs. 1–13.—Schlumberger, Feuille des Jeun. Nat., Aug. 1883, p. 119, pl. 2, figs. 6, 6*a–c*, 7, 7*a*, 8.—H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 680, pl. 98, figs. 1–12.—Egger, Abhandl. kön. bay. Akad. Wiss. München, Cl. II, vol 18, 1893, p. 439, pl. 21, figs. 8, 9.—Woodward, The Observer, 1893, p. 177.—Goës, Kongl. Svensk. Vet. Akad. Handl., vol. 25, No. 9, 1894, p. 92, pl. 15, fig. 789, 789*a–c*; Bull. Mus. Comp. Zoöl., vol. 29, 1896, p. 74.—Flint, Ann. Rep. U. S. Nat. Mus., 1897 (1899), p. 336, pl. 79, fig. 4.—Kiaer, Rep't. Norwegian Fish. and Mar. Invest., vol. 1, No. 7, 1900, p. 46.—Schubert, Abhandl. geol. Reichs., vol. 20, pt. 4, 1911, p. 109, pl. 4, fig. 7.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 5, 1915, p. 50, pl. 21, figs. 2–5.—Galloway and Wissler, Journ. Pal., vol. 1, 1927, p. 68, pl. 11, fig. 4.—Cushman, Special Publ. No. 1, Cushman Lab. Foram. Res., 1928, pl. 52, figs. 10–13.

Test attached, the early stage close coiled, when detached showing the early chambers of the dorsal side, the aperture extending to the periphery, in a later stage forming a low cone with the inner ends of the chamber fused in a spiral and the aperture running from this groove to the periphery, in the adult the chambers form a spiral extending upward from the plane of attachment, and become inflated, the aperture terminal and semicircular with a rounded lip; sutures becoming somewhat limbate; wall coarsely perforate.

Length up to 1.68 mm.; diameter of adult chambers 0.75 mm.

Wallich's types came from off the South of Greenland, 108 to 1,205 fathoms. Brady records it from "13 *Porcupine* stations and one *Challenger* station in the North Atlantic—the latter off the Azores being the most southerly—the depth ranging from 5 fathoms on the Rockall Bank to 1,360 fathoms. Poor examples have been met with in dredgings from off the Cape of Good Hope, 150 fathoms, north of the Falkland Islands, 1,035 fathoms, and in the South Pacific, near Juan Fernandez, 1,375 fathoms. Schlumberger's specimens were from the Bay of Biscay." Egger records it from off the Cape Verde Islands; from off West Africa; off Mauritius and off Western Australia. Goës records it from off Scandinavia and in the Pacific off Acapulco, Mexico, 772 fathoms. Flint's *Albatross* stations are D2530 off the Eastern Coast of the United States, and D2383 Gulf of Mexico, depths 956 and 1,181 fathoms. Kiaer's specimens were from off Christiansund, 911 meters and Vesteraalseggen, 1,187 fathoms, single specimens at each station. I have recorded it from the North Pacific, and have material from the *Porcupine* dredgings in the Atlantic.

As a fossil, it has been recorded from the Late Tertiary of the Bismarck Archipelago by Schubert, and from Lomita Quarry, southern California by Galloway and Wissler. Uhlig's record from the "Alttertiar" of the West Galician Carpathians is another species.

Rupertia stabilis—Material examined

Catalogue No.	Collection of—	Number of specimens	Station	Locality	Depth in fathoms	Bottom temperature	Character of bottom	Abundance
10466	J. A. C.	3	*Porcupine* 16		994			Few.
5026	J. A. C.	1	16		994			Do.

Genus CARPENTERIA Gray, 1858

Carpenteria Gray, Proc. Zool. Soc. London, vol. 26, 1858, p. 269.—H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 676.—Chapman, The Foraminifera, 1902, p. 220.—Cushman, Smithsonian Misc. Coll., vol. 77, No. 4, 1925, p. 45; Special Publ. No. 1, Cushman Lab. Foram. Res., 1928, p. 331.

Dujardinia Gray, Proc. Zool. Soc. London, vol. 26, 1858, p. 269.

Genoholotype.—Carpenteria balaniformis Gray.

Test attached, early chambers trochoid, later spreading out over the surface of attachment both with the inner ends piled up in a loose spire or the whole test becoming subcylindrical, the chambers loosely spiral or even uniserial; wall calcareous, coarsely perforate; aperture in the young narrow, in the older stages somewhat rounded at the end of a tubular projection, and in the uniserial forms sometimes with a tubular neck.

This genus is apparently present in the Cretaceous and certainly in the Eocene. Some of the species have a widely spreading form with little building up into a high spire, while others develop a very long test. The representatives of the genus are most abundant in the shallow water of the Indo-Pacific although at least one species or variety has become adapted to fairly deep water.

CARPENTERIA PROTEIFORMIS Goës

Plate 26, figure 1

Carpenteria balaniformis Gray, var. *proteiformis* Goës, Kongl. Svensk. Vet. Akad. Handl., vol. 19, No. 4, 1882, p. 94, pl. 6, figs. 208–214; pl. 7, figs. 215–219.

Carpenteria proteiformis H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 679, pl. 97, figs. 8–14.—Woodward, The Observer, vol 4, 1893, p. 177.—Goës, Bull. Mus. Comp. Zoöl., vol. 29, 1896, p. 74, pl. 6, figs. 8–17.—Chapman, Journ. Linn. Soc. Zool., vol. 28, 1900, pp. 195, 209, 406, pl. 19, fig. 11.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 5, 1915, p. 49, pl. 20, fig. 2; pl. 21, fig. 1; Proc. U. S. Nat. Mus., vol. 56, 1919, p. 629; Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 361, pl. 73, figs. 2, 3.—Heron-Allen and Earland, British Antarctic Exped., Zoology, vol. 6, 1922, p. 213.—Yabe and Hanzawa, Jap. Journ. Geol. Pal., vol. 4, 1925 (1926), p. 52.

Test attached, columnar, basal portion usually somewhat spreading and buttressed; early chambers coiled, attached by the dorsal side but covered by the later ones which become much inflated and built up into an irregular, subcylindrical column of a few chambers; wall coarsely porous; aperture often with a tubular neck and slight lip.

Length up to 6 mm.

This species is often abundant in fairly deep water in the West Indian region where it attains a large size. The types are from the Caribbean. The *Challenger* records are as follows: "Off Culebra

Island, West Indies, depth 390 fathoms; but the species occurs also at station 33, off Bermuda, 435 fathoms, and at two points in the Eastern Archipelago, namely Nares Harbour, Admiralty Islands, 17 fathoms, and off Raine Island, Torres Strait, 155 fathoms." I have had excellent specimens dredged by the *Hassler* expedition in 100 fathoms off the Barbados.

Specimens very similar to the West Indian species occur in various parts of the Pacific, but whether or not they are the same needs further study.

There are numerous fossil records referred to this species, but these again should be carefully compared with living West Indian material.

CARPENTERIA MONTICULARIS Carter

Brady records this species from a *Challenger* station off Bermuda, 435 fathoms, and Egger records it from off West Africa. I have not seen this species in the *Albatross* collections or others from the West Indian region. It is common in some parts of the Indo-Pacific, and a very similar form occurs in the Eocene of the coastal plain of the United States.

CARPENTERIA UTRICULARIS Carter

Carter records this species as common in the West Indies, but it has not occurred in the *Albatross* or other dredgings that I have from that region. Brady records it from off Pernambuco, Brazil, in 350 fathoms. Egger records it from off the Cape Verde Islands and off West Africa, but his figure is not very typical of this species. Most of the records for the species are from the Indo-Pacific.

CARPENTERIA HASSLERI, new species

Plate 26, figures 2–5

Test attached, in the early stages coiled, later in an irregular spiral, the chambers in an irregular spiral about an ascending axis, the upper end of the chamber prolonged into a long tubular extension, with the aperture apparently at the tip; wall smooth, finely perforate.

Height up to 10 mm.

Holotype (Cat. No. 21931, U.S.N.M.) from 100 fathoms off Barbados.

There are numerous specimens of this peculiar species dredged by the *Hassler* Expedition at the above locality, but I have not seen it elsewhere. The peculiar extension of the chamber and the loose spiral produce some very bizarre forms.

With these is a specimen (pl. 26, fig. 6) which is close to *Carpenteria rhaphidodendron* Moebius or to some of the specimens referred by Hofker to *C. utricularis* Carter.

Genus EORUPERTIA Yabe and Hanzawa, 1927

Eorupertia YABE and HANZAWA, in Cushman, Contr. Cushman Lab. Foram. Res., vol. 3, 1927, p. 97.—CUSHMAN, Special Publ. No. 1, Cushman Lab. Foram. Res., 1928, p. 331.

Uhligina YABE and HANZAWA, Jap. Journ. Geol. Geogr., vol. 1, 1922, p. 71 (genoholotype, *Uhligina boninensis* Yabe and Hanzawa) (not *Uhligina* Schubert).

Genoholotype.—*Uhligina boninensis* Yabe and Hanzawa.

Test with the early stages coiled, later in a subcylindrical form, the chambers in an elongate spiral about a hollow center; wall calcareous, coarsely perforate, developing canals and pillars; aperture not well distinguished.

This genus allied to the foregoing is known only as a fossil in the Early Tertiary.

Family 44. HOMOTREMIDAE

Test in the early stages trochoid, attached by the dorsal surface, later becoming irregular and growing upward from the area of attachment into a more or less branched mass, all trace of the early arrangement being lost; wall calcareous, coarsely perforate; apertures large, open or covered by a perforated plate; a reddish or orange color strongly developed.

The forms belonging in this family have been excellently described by Hickson—On *Polytrema* and Some Allied Genera.[50] There are three genera as noted below. So far as recorded, *Homotrema* is the only one of the three in the West Indian region where it is exceedingly abundant. The others are known from the Indo-Pacific. All occur in comparatively shallow, warm waters often in the case of *Homotrema* in the West Indies in pools left by the tide and which become very hot in the sun. Little is definitely known of the family in the fossil state, although specimens have been recorded as "Polytrema," a name which before the appearance of Hickson's paper was usually applied to all the members of the family.

Genus HOMOTREMA Hickson, 1911

Homotrema HICKSON, Trans. Linn. Soc., London, Zool., vol. 14, 1911, p. 445.—CUSHMAN, Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 364; Smithsonian Misc. Coll., vol. 77, No. 4, 1925, p. 47; Special Publ. No. 1, Cushman Lab. Foram. Res., 1928, p. 332.

Millepora LAMARCK, 1816 (not Linnaeus).

Polytrema (part) of AUTHORS (not Risso).

Genoholotype.—*Millepora rubra* Lamarck.

Test attached, the early stages coiled, later extending up in an irregular mass with short stout projecting portions; wall calcareous, the surface solid with large scattered foramina covered by a finely perforated plate; color dark red.

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[50] Trans. Linn. Soc. London, Zoology, vol. 14, No. 20, 1911.

Recent.

There seems to be but a single species, very widely distributed.

HOMOTREMA RUBRUM (Lamarck)

Millepora rubra Lamarck, Hist. Nat. Anim. sans Vert., vol. 2, 1816, p. 202.
Polytrema rubra Dujardin, Hist. Nat. Zooph., 1841, p. 259.—Carpenter, Parker, and Jones, Introd. Foram., 1862, p. 235, pl. 13, figs. 18–20.
Homotrema rubrum Hickson, Trans. Linn. Soc. London, Zool., ser. 2, vol. 14, 1911, pp. 445, 454, pl. 30, fig. 2; pl. 31, fig. 9; pl. 32, figs. 19, 22, 28.—Pearcey, Trans. Roy. Soc. Edinburgh, vol. 49, 1914, p. 1041.—Heron-Allen and Earland, Trans. Zool. Soc. London, vol. 20, 1915, p. 729.—Cushman, Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 364; Publ. 311, Carnegie Instit., Washington, 1922, p. 53, pl. 14, figs. 6–8; Special Publ. No. 1, Cushman Lab. Foram. Res., 1928, pl. 52, figs. 25–27.

Test attached, earliest chambers in a whorl, later ones forming an irregular mass, honeycombed, the surface composed of a reticulate pattern, the central portion of each mesh with a thin perforated plate, the walls of the mesh work solid and nonporous; whole mass raised into irregular subcylindrical masses in the early stages, then fusing and spreading so that the whole test becomes an irregularly rounded mass rising above the surface of attachment with papillae raised above the rest of the surface; color bright to dull red.

Diameter of large mass up to 8 mm.

This species is generally distributed in the West Indian region, in very warm shallow water, at the Dry Tortugas and extending to the coast of Brazil.

The Tortugas specimens showed the tips of the test with a crown of projecting spicules, evidently sponge spicules which were cemented into long flexible lines forming a crown about the projecting parts of the test. At the Tortugas species occurred in great numbers almost covering the under sides of shell and coral fragments in shallow lagoons and on dead reefs, where the temperatures at low tide were often warm to the hand.

Genus SPORADOTREMA Hickson, 1911

Sporadotrema Hickson, Trans. Linn. Soc. Zool., vol. 14, 1911, p. 447.—Cushman, Special Publ. No. 1, Cushman Lab. Foram. Res., 1928, p. 334.
Polytrema Carter, 1880 (not Risso).

Genoholotype—Polytrema cylindricum Carter.

Test attached, the early stages coiled, later extending outward and upward into short stout branches, numerous chambers apparent about the outer end; wall calcareous, the surface solid with scattered foramina, open, not covered by a plate; color, orange or red.

Recent.

This genus is not known in the Atlantic.

Genus POLYTREMA Risso, 1826

Polytrema Risso, Hist. Nat. Europe Merid., vol. 5, 1826, p. 340.—Cushman, Special Publ. No. 1, Cushman Lab. Foram. Res., 1928, p. 334.

Millepora (part) of Authors.

Pustularia Gray, Proc. Zool. Soc. London, vol. 26, 1858, p. 271 (genoholotype, *Pustularia rosea* Gray).

Genoholotype.—*Polytrema corallina* Risso = *Millepora miniacea* Pallas.

Test attached, in the early stages coiled, later with the small chambers piled up in an irregular branching mass with slender projections; wall calcareous, perforate, the surface finely perforate with larger open foramina; color light red.

Late Tertiary and Recent.

Although *Polytrema* has been recorded from the Atlantic, it is probable that most, if not all, the records are *Homotrema*, at least as far as the West Indian region is concerned.

PLATES

EXPLANATION OF PLATES

Plate 1

Figures 1. *Spirillina vivipara* Ehrenberg. (After Ehrenberg.) Specimen from off Vera Cruz, Mexico.

2–4. *Spirillina vivipara* Ehrenberg. × 70. Fig. 2, Porto Rico. Fig. 3, Dry Tortugas, *a*, *b*, opposite sides. Figs. 4 *a–c*, Dry Tortugas. *a*, *b*, opposite sides; *c*, peripheral view.

5 *a*, *b*. *Spirillina vivipara* Ehrenberg, var. *densepunctata* Cushman, new variety. × 70. Porto Rico. *a*, *b*, opposite sides.

6. *Spirillina perforata* (Schultze). (After Schultze.)

7 *a–c*. *Spirillina perforata* (Schultze). × 75. Off coast of Belgium. *a*, *b*, opposite sides; *c*, peripheral view.

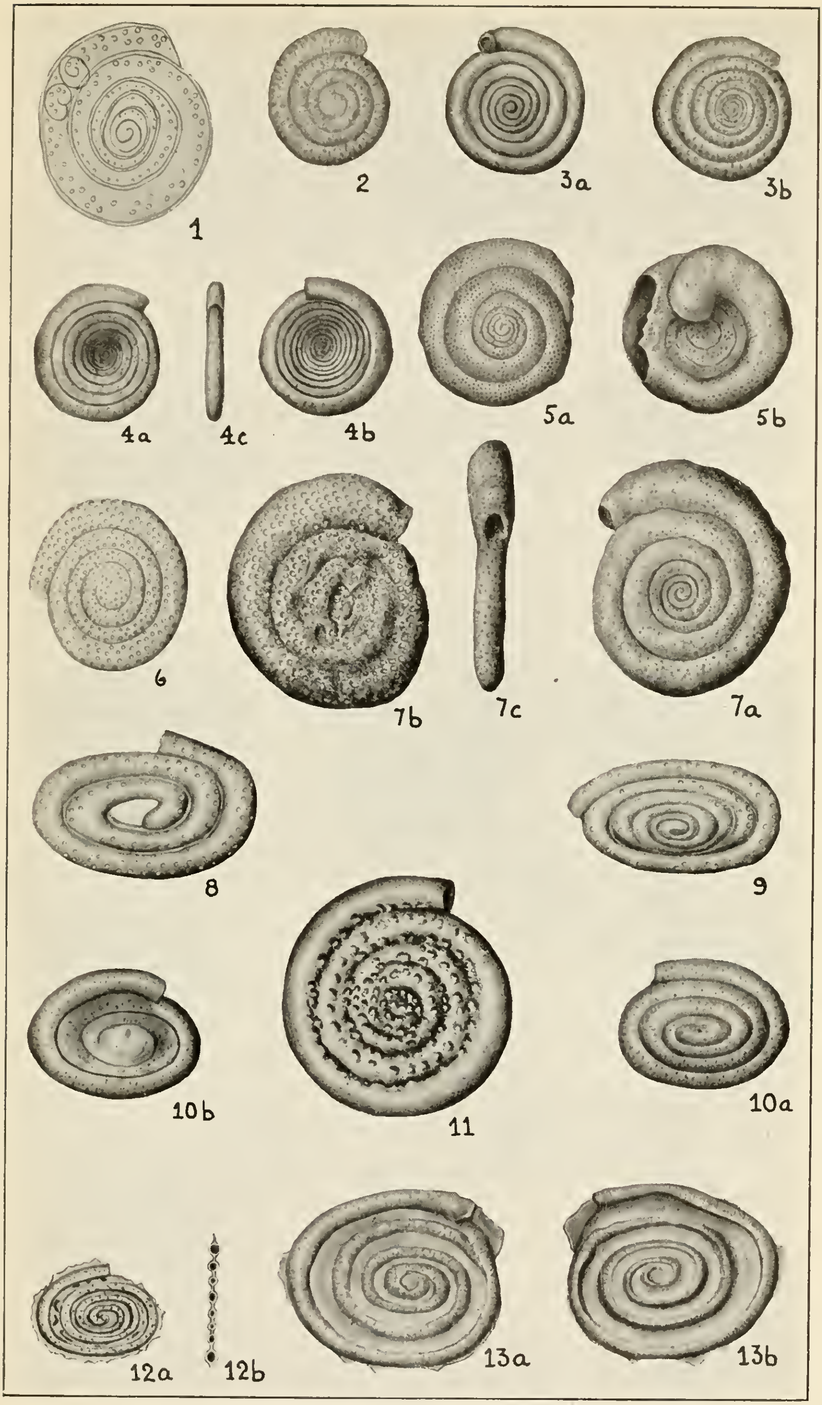
8, 9. *Spirillina obconica* H. B. Brady (?). (After Heron-Allen and Earland.) Off British Isles.

10 *a*, *b*. *Spirillina obconica* H. B. Brady (?). × 135. *Porcupine* Station 7. Off British Isles. *a*, *b*, opposite sides.

11. *Spirillina margaritifera* Williamson. (After Williamson.)

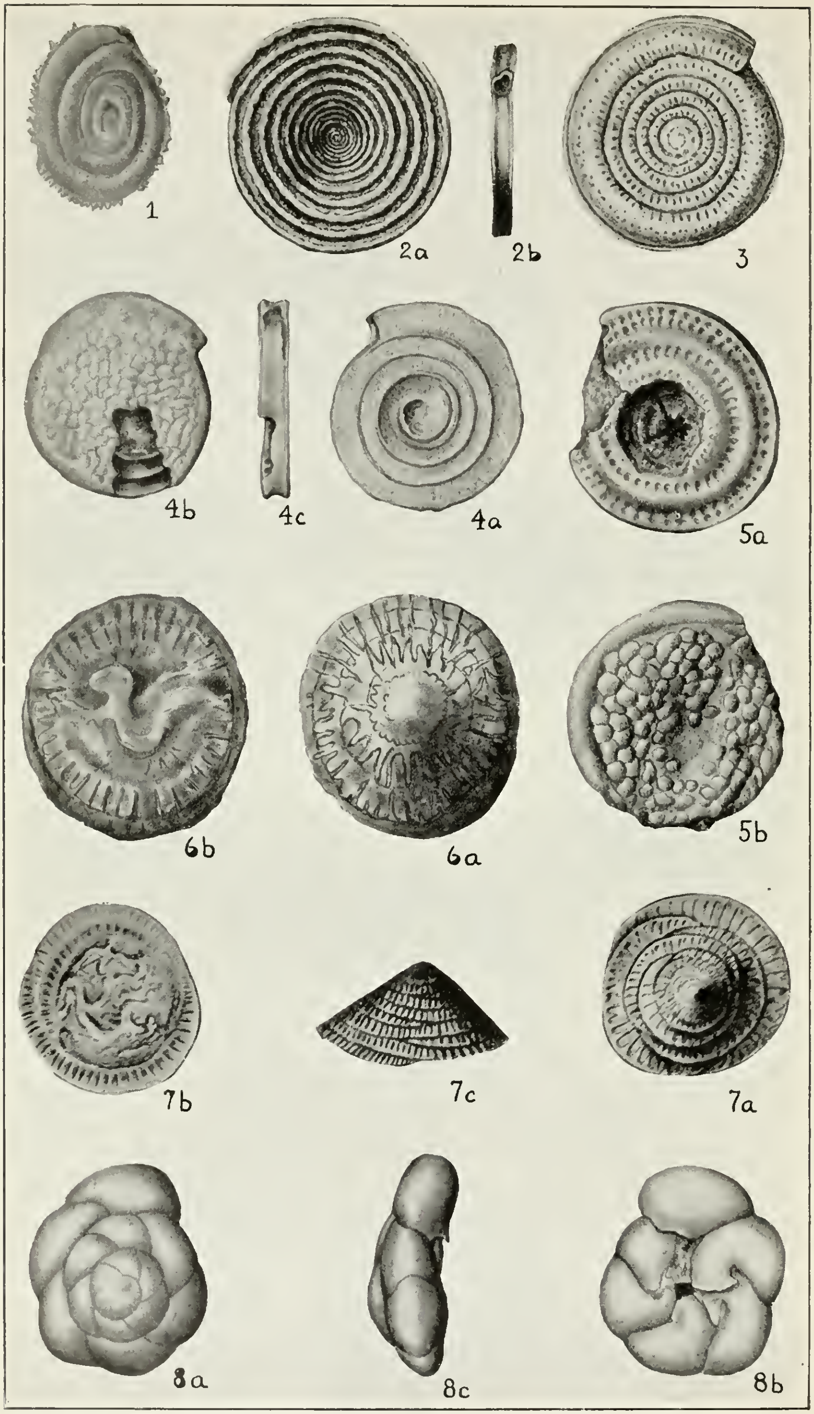
12 *a*, *b*. *Spirillina lateseptata* Terquem. (After Halkyard.) From off Island of Jersey. *a*, side view; *b*, section.

13 *a*, *b*. *Spirillina lateseptata* Terquem. × 100. From *Porcupine* Station 7. *a*, *b*, opposite sides.



ROTALIIDAE OF THE ATLANTIC OCEAN

FOR EXPLANATION OF PLATE SEE PAGE 146.



ROTALIIDAE OF THE ATLANTIC OCEAN

FOR EXPLANATION OF PLATE SEE PAGE 147

PLATE 2

FIGURES 1. *Spirillina tateseptata* Terquem. × 75. Coast of Belgium.

2 *a*, *b*. *Spirillina limbata* H. B. Brady. (After H. B. Brady.) *a*, side view; *b*, peripheral view.

3. *Spirillina decorata* H. B. Brady. (After H. B. Brady.) Off the Canary Islands.

4, 5. *Spirillina limbata* H. B. Brady, var. *denticulata* H. B. Brady. Figs. 4 *a–c*, × 55. Off Plymouth, England. *a*, *b*, opposite sides; *c*, peripheral view. Figs. 5 *a*, *b*, × 90. Coast of Belgium. *a*, *b*, opposite sides.

6 *a*, *b*. *Patellina corrugata* Williamson. × 100. Off coast of Belgium. *a*, dorsal side; *b*, ventral side.

7 *a–c*. *Patellina corrugata* Williamson. (After Williamson.) *a*, dorsal view; *b*, ventral view; *c*, peripheral view.

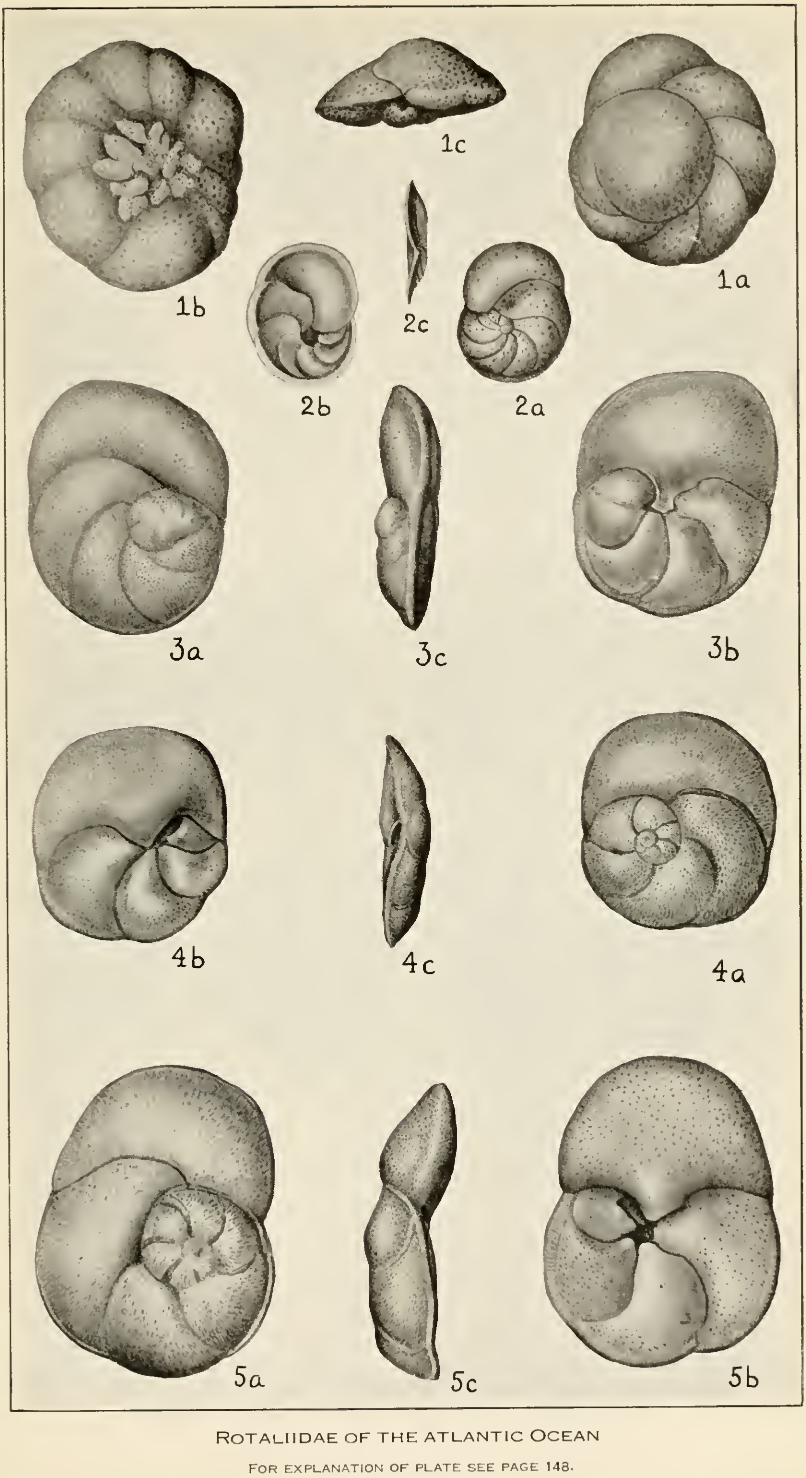
8 *a–c*. *Discorbis advena* Cushman. × 55. Dry Tortugas, Fla. *a*, dorsal view; *b*, ventral view; *c*, peripheral view.

PLATE 3

FIGURES 1 *a–c*. *Discorbis baccata* (Heron-Allen and Earland). × 90. Off British Isles. *a*, dorsal view; *b*, ventral view; *c*, peripheral view.

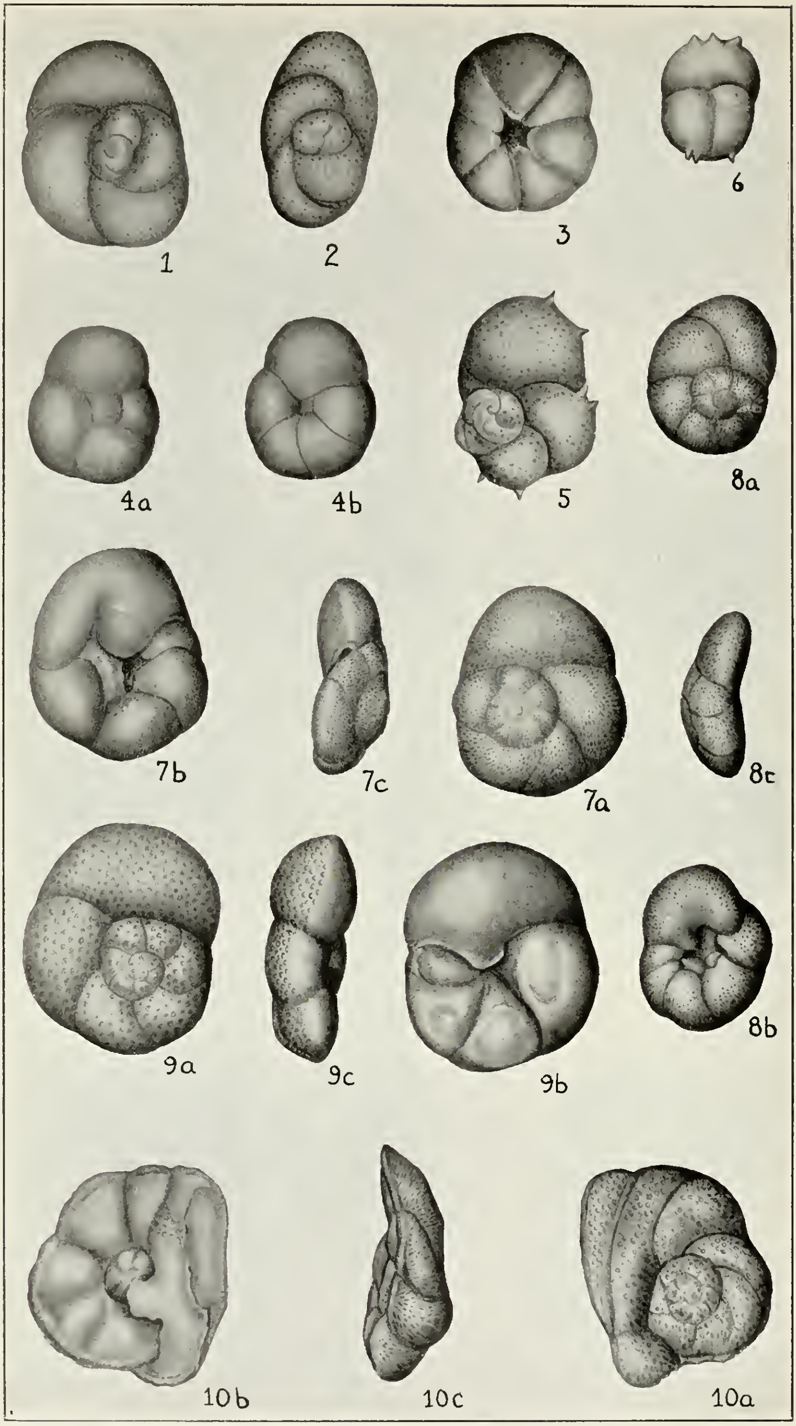
2 *a–c*. *Discorbis bertheloti* (d'Orbigny). (After d'Orbigny.) *a*, dorsal view; *b*, ventral view; *c*, peripheral view.

3–5. *Discorbis bertheloti* (d'Orbigny), var. *floridensis* Cushman, new variety. Specimens from off Fowey, Fla. *a*, *a*, *a*, dorsal views; *b*, *b*, *b*, ventral views; *c*, *c*, *c*, peripheral views. Fig. 3, Holotype. × 50. Figs. 4, 5, × 40.



ROTALIIDAE OF THE ATLANTIC OCEAN

FOR EXPLANATION OF PLATE SEE PAGE 148.



ROTALIIDAE OF THE ATLANTIC OCEAN

FOR EXPLANATION OF PLATE SEE PAGE 149.

PLATE 4

FIGURES 1–3. *Discorbis chasteri* (Heron-Allen and Earland). × 200. (After Heron-Allen and Earland.) Figs. 1, 2, Dorsal views. Fig. 3, Ventral view.

4 *a, b*. *Discorbis chasteri* (Heron-Allen and Earland). × 150. From off Faroe Islands. *a*, dorsal view; *b*, ventral view.

5. *Discorbis chasteri* (Heron-Allen and Earland), var. *bispinosa* (Heron-Allen and Earland). × 200. (After Heron-Allen and Earland.)

6. *Discorbis chasteri* (Heron-Allen and Earland), var. *bispinosa* (Heron-Allen and Earland). × 150. From off Faroe Islands.

7, 8. *Discorbis floridana* Cushman. × 100. *a, a*, dorsal views; *b, b*, ventral views; *c, c*, peripheral views. Fig. 7, Montego Bay, Jamaica. Fig. 8, Dry Tortugas, Fla.

9 *a–c*. *Discorbis globularis* (d'Orbigny). × 100. Dogs Bay, Ireland. *a*, dorsal view; *b*, ventral view; *c*, peripheral view.

10 *a–c*. *Discorbis globularis* (d'Orbigny), var. *anglica* Cushman, new variety. × 50. Off Nose Head, Moray Firth. *a*, dorsal view; *b*, ventral view; *c*, peripheral view.

PLATE 5

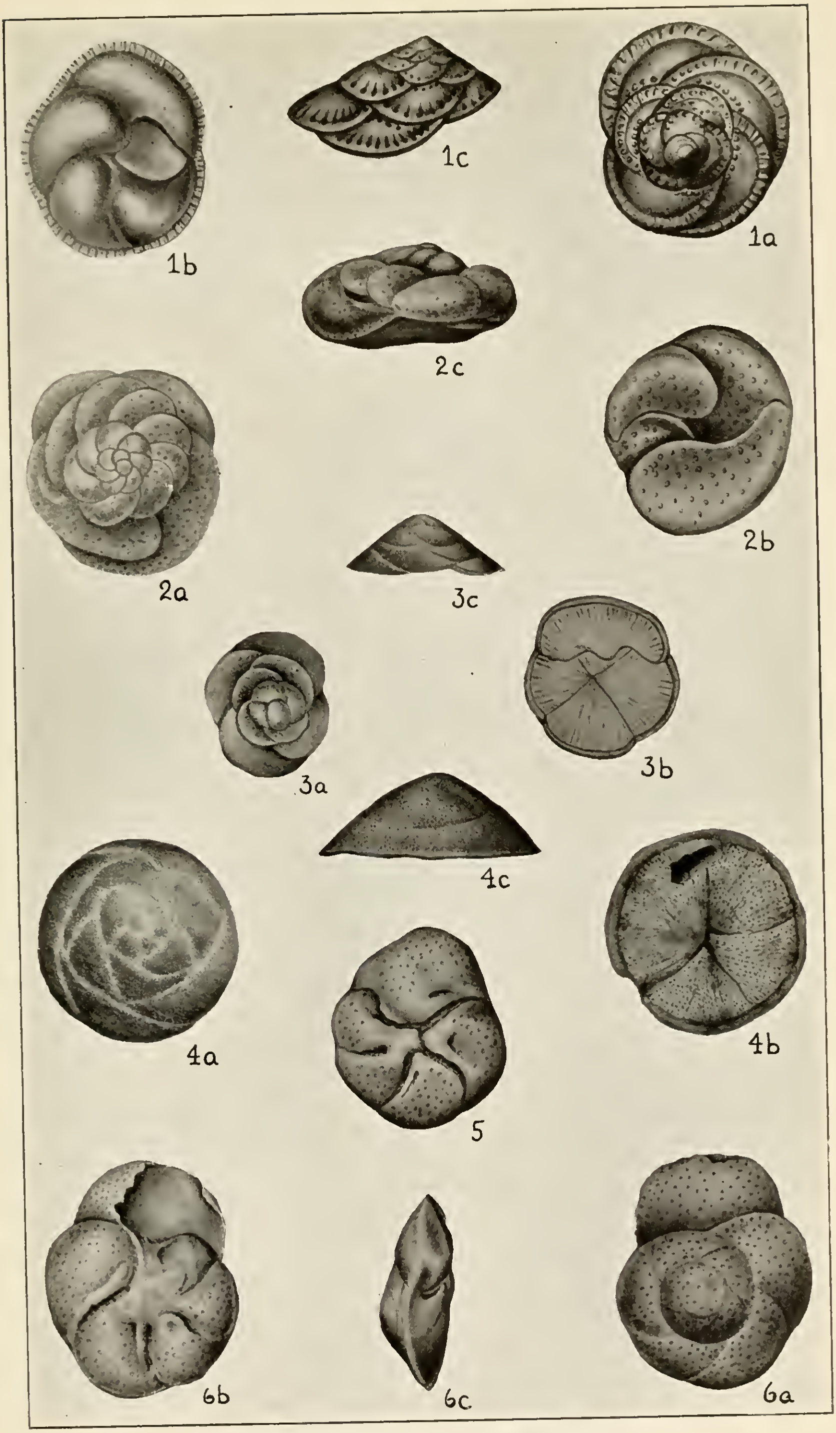
FIGURES 1 *a–c*. *Discorbis mamilla* (Williamson). (After Williamson.) *a*, dorsal view; *b*, ventral view; *c*, peripheral view.

2 *a–c*. *Discorbis mediterranensis* (d'Orbigny). (After Heron-Allen and Earland.) Clare Island Region, Ireland. *a*, dorsal view; *b*, ventral view; *c*, peripheral view.

3 *a–c*. *Discorbis millettii* (Wright). (After Wright.) *a*, dorsal view; *b*, ventral view; *c*, peripheral view.

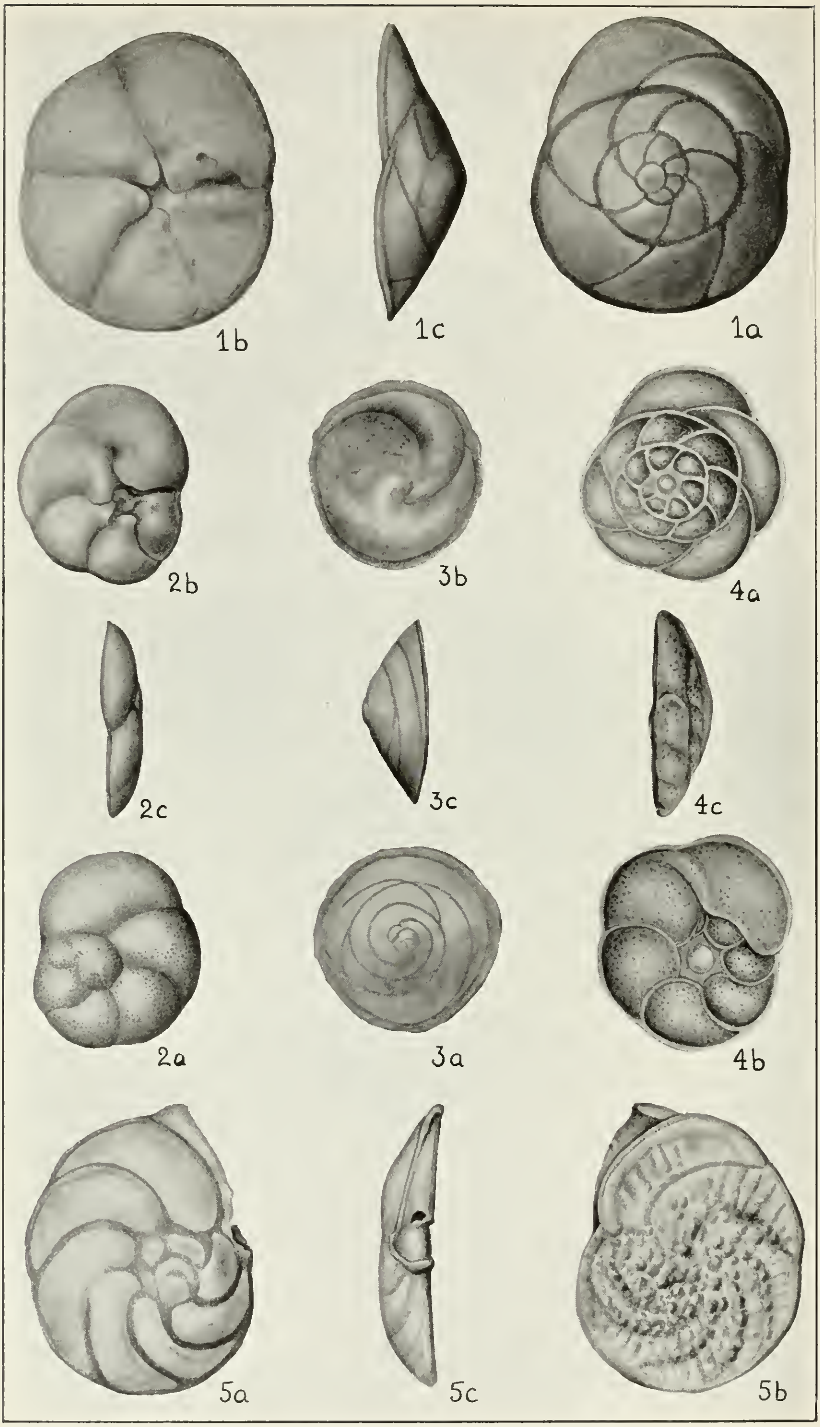
4 *a–c*. *Discorbis millettii* (Wright). × 100. Coast of Belgium. *a*, dorsal view; *b*, ventral view; *c*, peripheral view.

5, 6. *Discorbis mira* Cushman. × 75. Montego Bay, Jamaica. *a*, dorsal view; *b*, ventral view; *c*, peripheral view.



ROTALIIDAE OF THE ATLANTIC OCEAN

FOR EXPLANATION OF PLATE SEE PAGE 150.



Rotaliidae of the Atlantic Ocean

For explanation of plate see page 151.

PLATE 6

FIGURES 1 *a–c*. *Discorbis nitida* (Williamson). × 75. Coast of Belgium. *a*. dorsal view; *b*, ventral view; *c*, peripheral view.

2 *a–c*. *Discorbis obtusa* (d'Orbigny) (?). × 55. Casco Bay, Me. *a*, dorsal view; *b*, ventral view; *c*, peripheral view.

3 *a–c*. *Discorbis orbicularis* (Terquem). × 75. Montego Bay, Jamaica. *a*, dorsal view; *b*, ventral view; *c*, peripheral view.

4 *a–c*. *Discorbis* (?) *praegeri* (Heron-Allen and Earland). × 100. (After Heron-Allen and Earland.) Clare Island Region, Ireland. *a*, dorsal view; *b*, ventral view; *c*, peripheral view.

5 *a–c*. *Discorbis parisiensis* (d'Orbigny) (?). × 75. Coast of Belgium. *a*, dorsal view; *b*, ventral view; *c*, peripheral view.

PLATE 7

FIGURES 1 *a, b.* *Discorbis orbicularis* (Terquem), var. *selseyensis* (Heron-Allen and Earland). × 75. (After Heron-Allen and Earland.) From off Selsey, England. *a*, dorsal view; *b*, ventral view.

2 *a–c.* *Discorbis subaraucana* Cushman. × 55. Dry Tortugas, Fla. *a*, dorsal view; *b*, ventral view; *c*, peripheral view.

3 *a–c.* *Discorbis valvulata* (d'Orbigny). × 70. Off Pocasset, Buzzards Bay, Mass. *a*, dorsal view; *b*, ventral view; *c*, peripheral view.

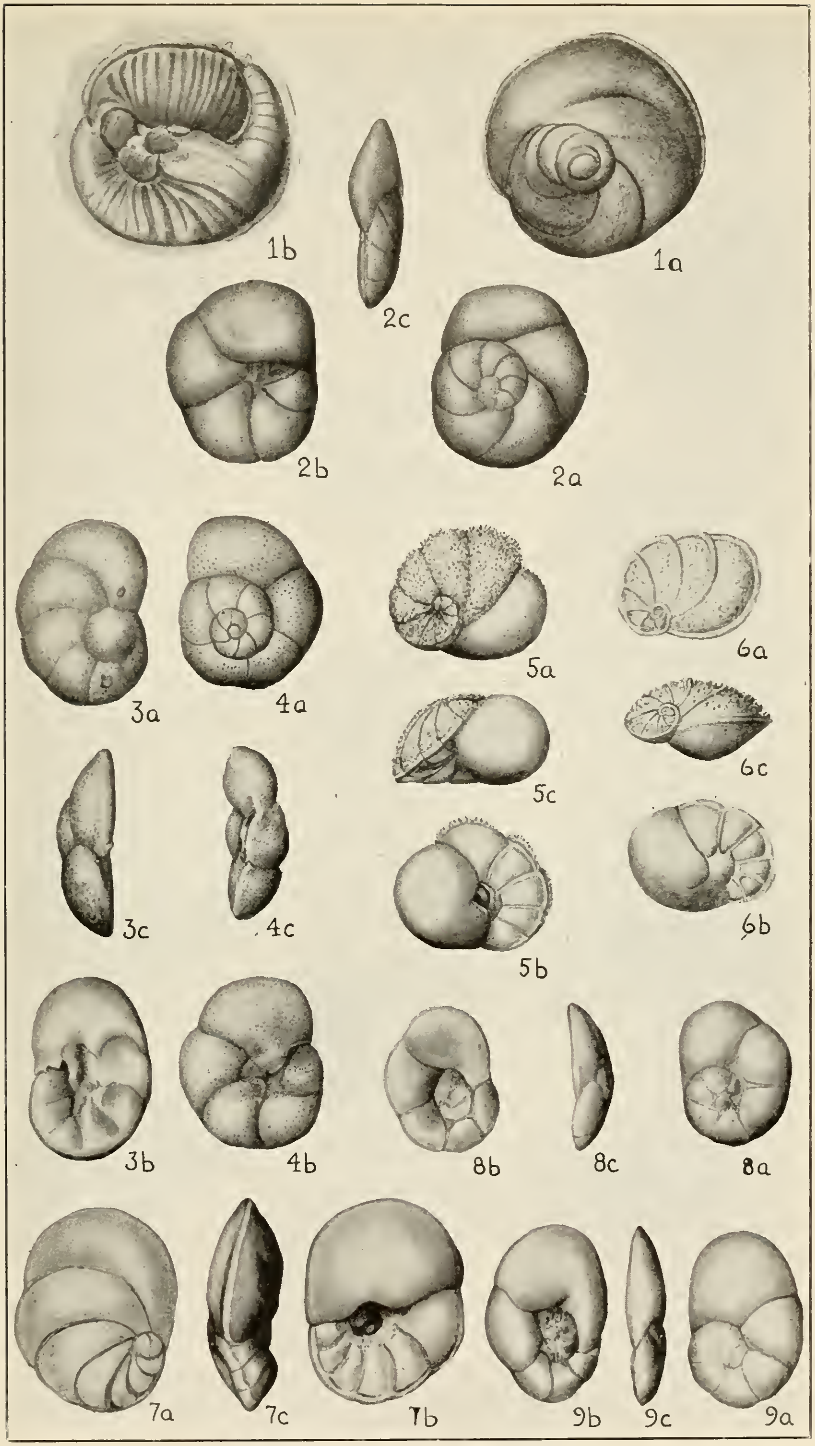
4 *a–c.* *Discorbis candeiana* (d'Orbigny). × 75. Off Fowey, Fla. *a*, dorsal view; *b*, ventral view; *c*, peripheral view.

5 *a–c.* *Lamarckina ventricosa* (H. B. Brady). × 40. (After H. B. Brady.) *a*, dorsal view; *b*, ventral view; *c*, peripheral view.

6 *a–c.* *Lamarckina scabra* (H. B. Brady). × 40. (After H. B. Brady.) *a*, dorsal view; *b*, ventral view; *c*, peripheral view.

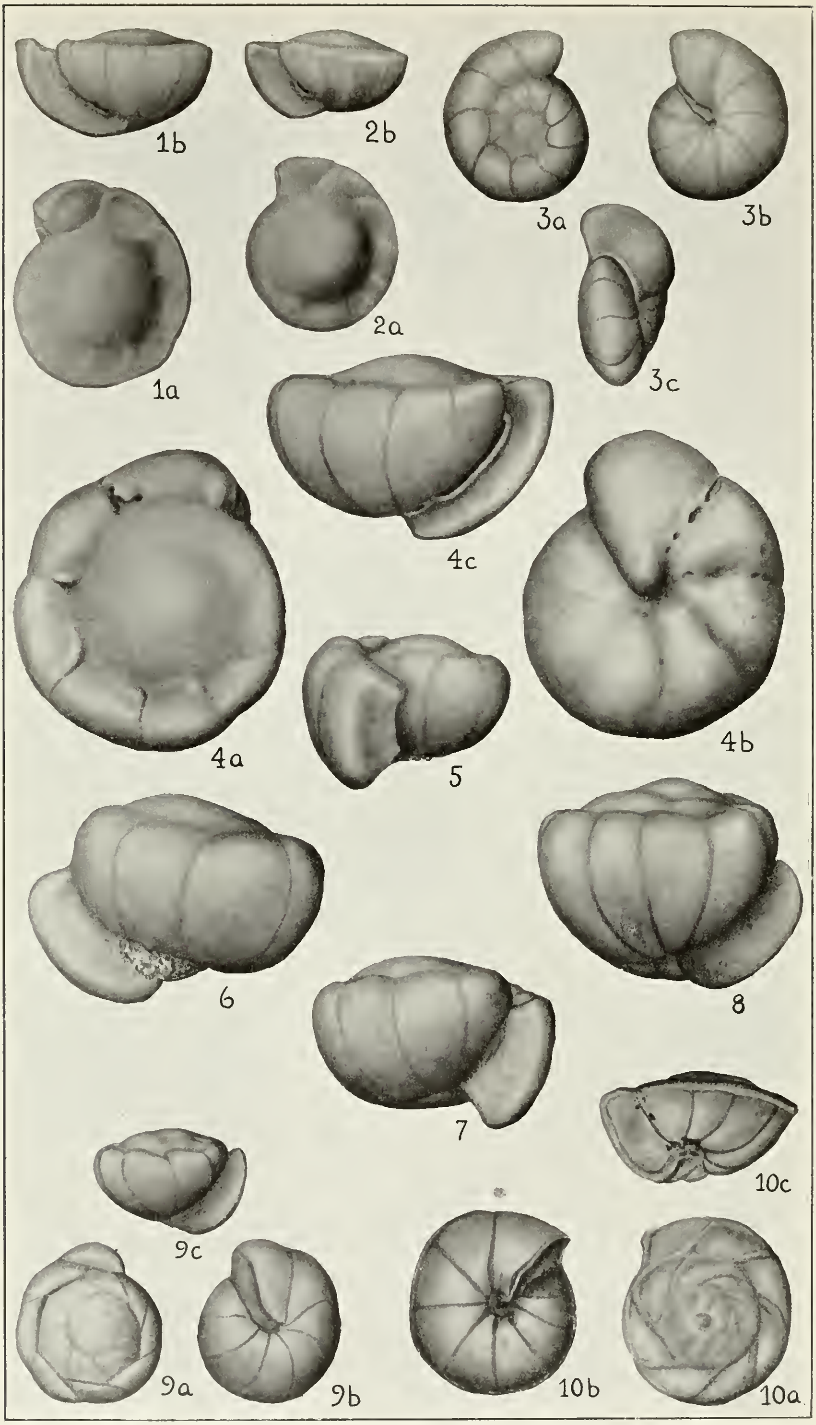
7 *a–c.* *Lamarckina atlantica* Cushman, new species. × 40. Off Fowey, Fla. *a*, dorsal view; *b*, ventral view; *c*, peripheral view.

8, 9. *Lamarckina haliotidea* (Heron-Allen and Earland). *a, a*, dorsal views; *b, b*, ventral views; *c, c*, peripheral views. Fig. 8, Young. × 100. Coast of Belgium. Fig. 9, × 70. Off Faroe Islands.



ROTALIIDAE OF THE ATLANTIC OCEAN

FOR EXPLANATION OF PLATE SEE PAGE 152.



Rotaliidae of the Atlantic Ocean

For explanation of plate see page 153.

PLATE 8

FIGURES 1, 2. *Gyroidina orbicularis* d'Orbigny. × 40. East coast of United States. *a*, *a*, dorsal views; *b*, *b*, peripheral views.

3–8. *Gyroidina soldanii* d'Orbigny. East coast of United States. Figs. 3 *a–c*, × 40. Young. *a*, dorsal view; *b*, ventral view; *c*, peripheral view. Figs. 4 *a–c*, × 30. Adult. *a*, dorsal view; *b*, ventral view; *c*, peripheral view. Figs. 5–8, Peripheral views.

9 *a–c*. *Gyroidina soldanii* d'Orbigny, var. *nitidula* (Schwager). × 40. East coast of United States. *a*, dorsal view; *b*, ventral view; *c*, peripheral view.

10 *a–c*. *Gyroidina soldanii* d'Orbigny, var. *altiformis* R. E. and K. C. Stewart. × 50. Off Fowey, Fla. *a*, dorsal view; *b*, ventral view; *c*, peripheral view.

PLATE 9

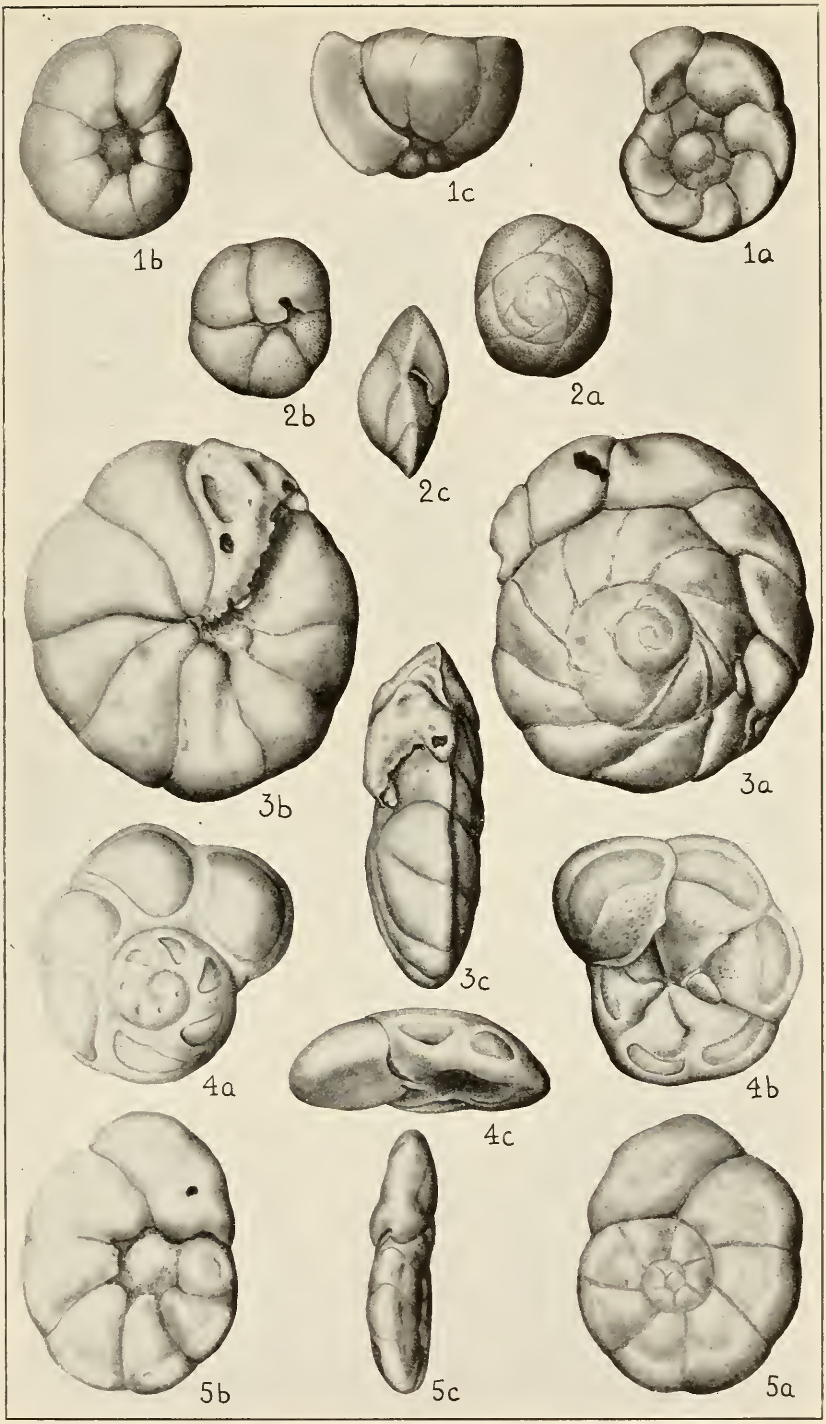
FIGURES 1 *a–c*. *Gyroidina soldanii* d'Orbigny, var. *altiformis* R. E. and K. C. Stewart. × 55. East coast of United States. *a*, dorsal view; *b*, ventral view; *c*, peripheral view.

2 *a–c*. *Eponides antillarum* (d'Orbigny). × 70. Young. Off Fowey, Fla. *a*, dorsal view; *b*, ventral view; *c*, peripheral view.

3 *a–c*. *Eponides umbonata* (Reuss), var. *ehrenbergii* (Bailey). × 30. Flattened microspheric form. Off east coast of United States. *a*, dorsal view; *b*, ventral view; *c*, peripheral view.

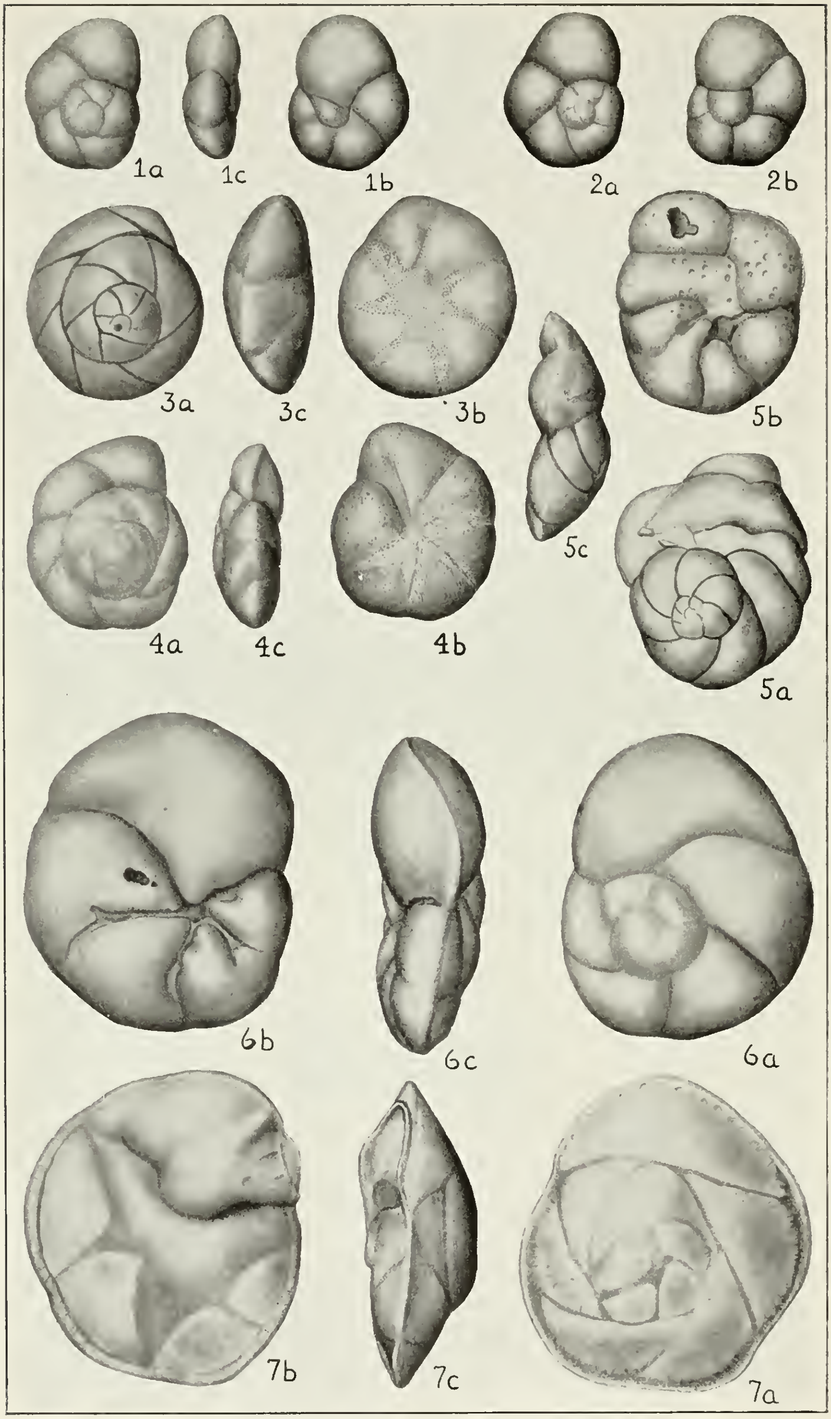
4 *a–c*. *Eponides concentrica* (Parker and Jones). × 30. (After H. B. Brady.) *a*, dorsal view; *b*, ventral view; *c*, peripheral view.

5 *a–c*. *Eponides concentrica* (Parker and Jones). × 90. Off coast of Belgium. *a*, dorsal view; *b*, ventral view; *c*, peripheral view.



ROTALIIDAE OF THE ATLANTIC OCEAN

FOR EXPLANATION OF PLATE SEE PAGE 154.



ROTALIIDAE OF THE ATLANTIC OCEAN

FOR EXPLANATION OF PLATE SEE PAGE 155.

PLATE 10

FIGURES 1, 2. *Eponides exigua* (H. B. Brady). × 70. Off east coast of United States. *a*, *a*, dorsal views; *b*, *b*, ventral views; *c*, peripheral view.

3, 4. *Eponides frigida* (Cushman), var. *calida* Cushman and Cole. × 70. Off Pocasset, Buzzards Bay, Mass. *a*, *a*, dorsal views; *b*, *b*, ventral views; *c*, *c*, peripheral views.

5 *a–c*. *Eponides* (?) *lateralis* (Terquem). × 40. Newport Beach, R. I. *a*, dorsal view; *b*, ventral view; *c*, peripheral view.

6 *a–c*. *Eponides punctulata* (d'Orbigny). × 35. East coast of United States. *a*, dorsal view; *b*, ventral view; *c*, peripheral view.

7 *a–c*. *Eponides repanda* (Fichtel and Moll). × 100. Young. Coast of Belgium. *a*, dorsal view; *b*, ventral view; *c*, peripheral view.

PLATE 11

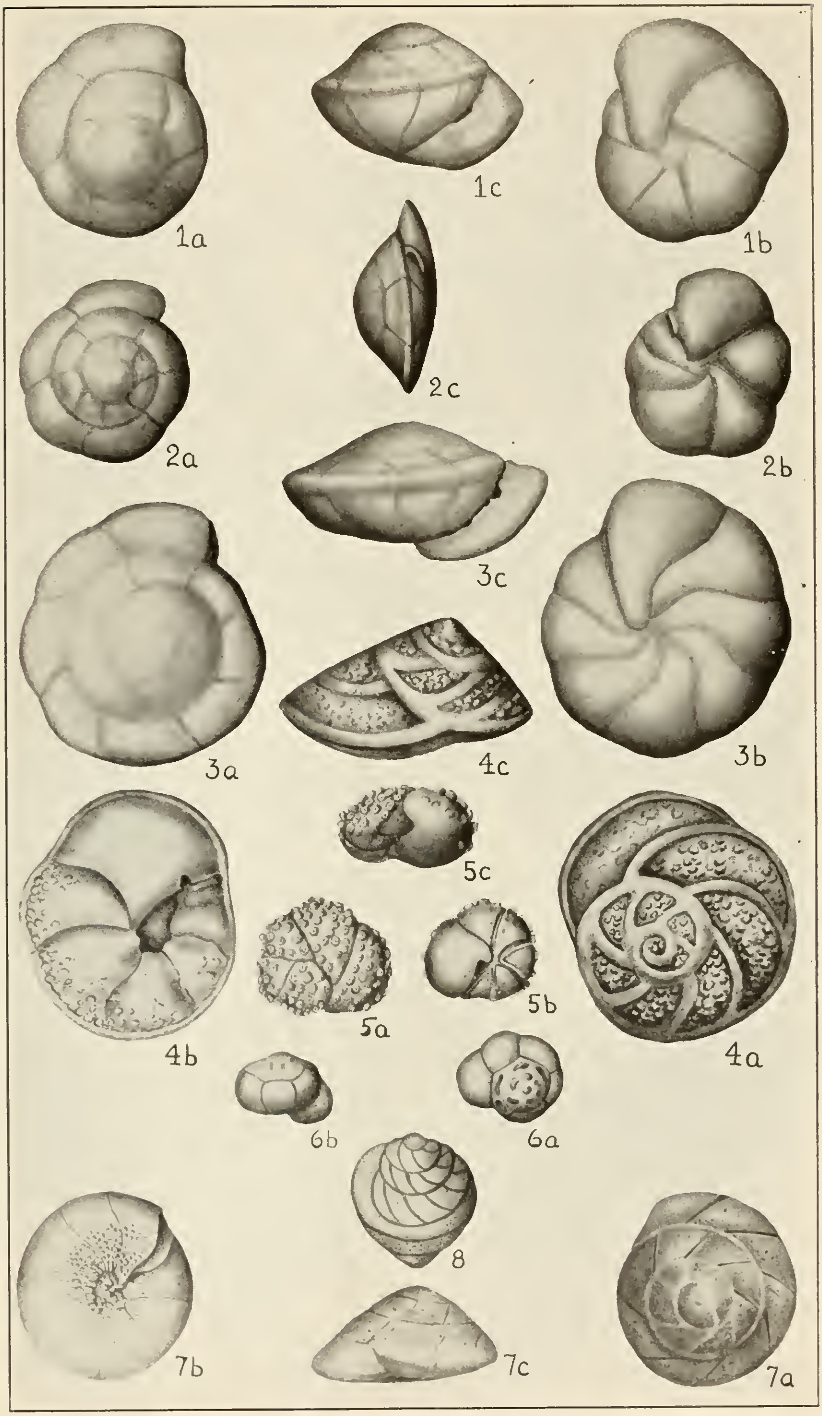
FIGURES 1–3. *Eponides umbonata* (Reuss). East coast of United States. Figs. 1, 2, × 70, Young specimen. Fig. 3, × 30, Adult. *a, a, a*. dorsal views; *b, b, b*, ventral views; *c, c, c*, peripheral views.

4 *a–c*. *Eponides repanda* (Fichtel and Moll), var. *concamerata* (Williamson). (After Williamson.) *a*, dorsal view; *b*, ventral view; *c*, peripheral view.

5 *a–c*. *Eponides (?) tuberculata* (Balkwill and Wright). × 120. (After Balkwill and Wright.) Off Dublin, Ireland. *a*, dorsal view; *b*, ventral view; *c*, peripheral view.

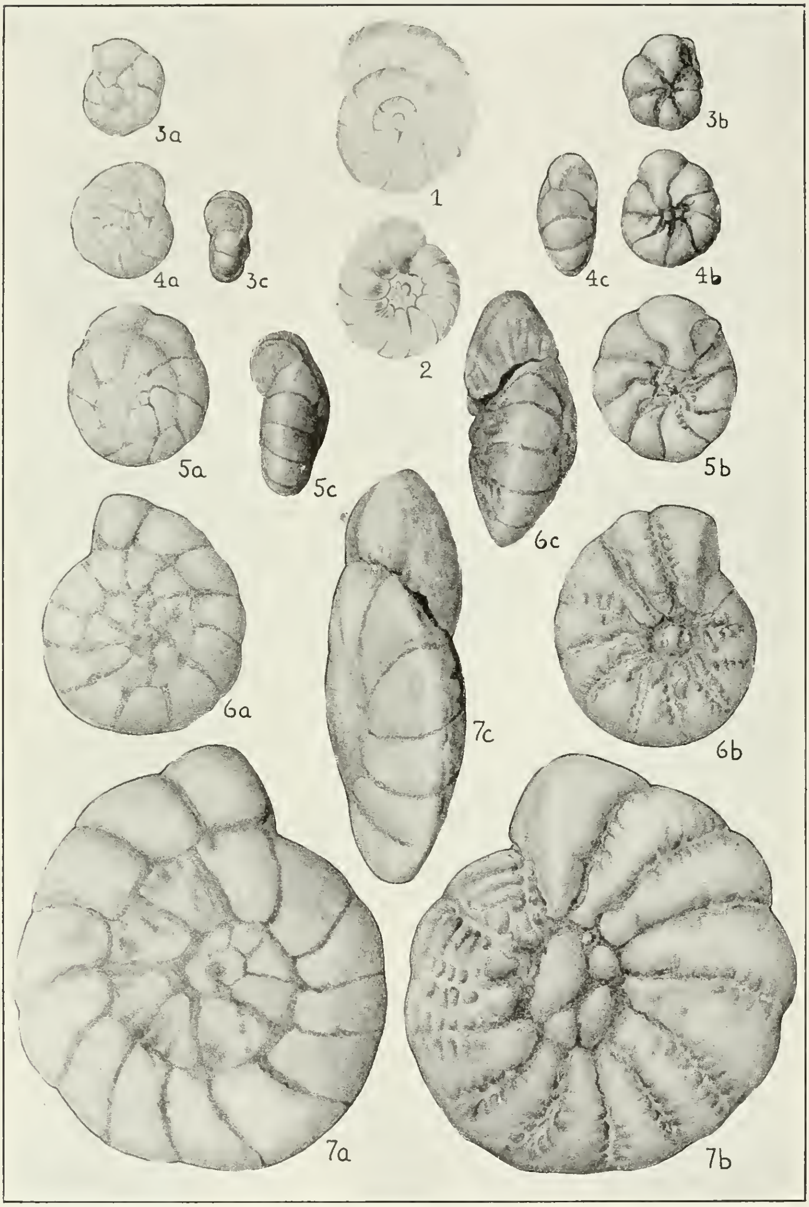
6 *a, b*. *Eponides tumidula* (H. B. Brady). × 75. (After H. B. Brady.) *a*, dorsal view; *b*, peripheral view.

7, 8. *Eponides wrightii* (H. B. Brady). Fig. 7 (After H. B. Brady.) *a*, dorsal view; *b*, ventral view; *c*, peripheral view. Fig. 8. (After Heron-Allen and Earland), Plastogamic specimen.



Rotaliidae of the Atlantic Ocean

For explanation of plate see page 156.



Rotaliidae of the Atlantic Ocean

For explanation of plate see page 157.

PLATE 12

Rotalia beccarii (Linnaeus)

FIGURES 1, 2. (After Plancus (Bianchi)). Original figures referred to by Linnaeus.
3–7. Series from Rimini showing the development stages. All × 40.
a, dorsal view; *b*, ventral view; *c*, peripheral view.

PLATE 13

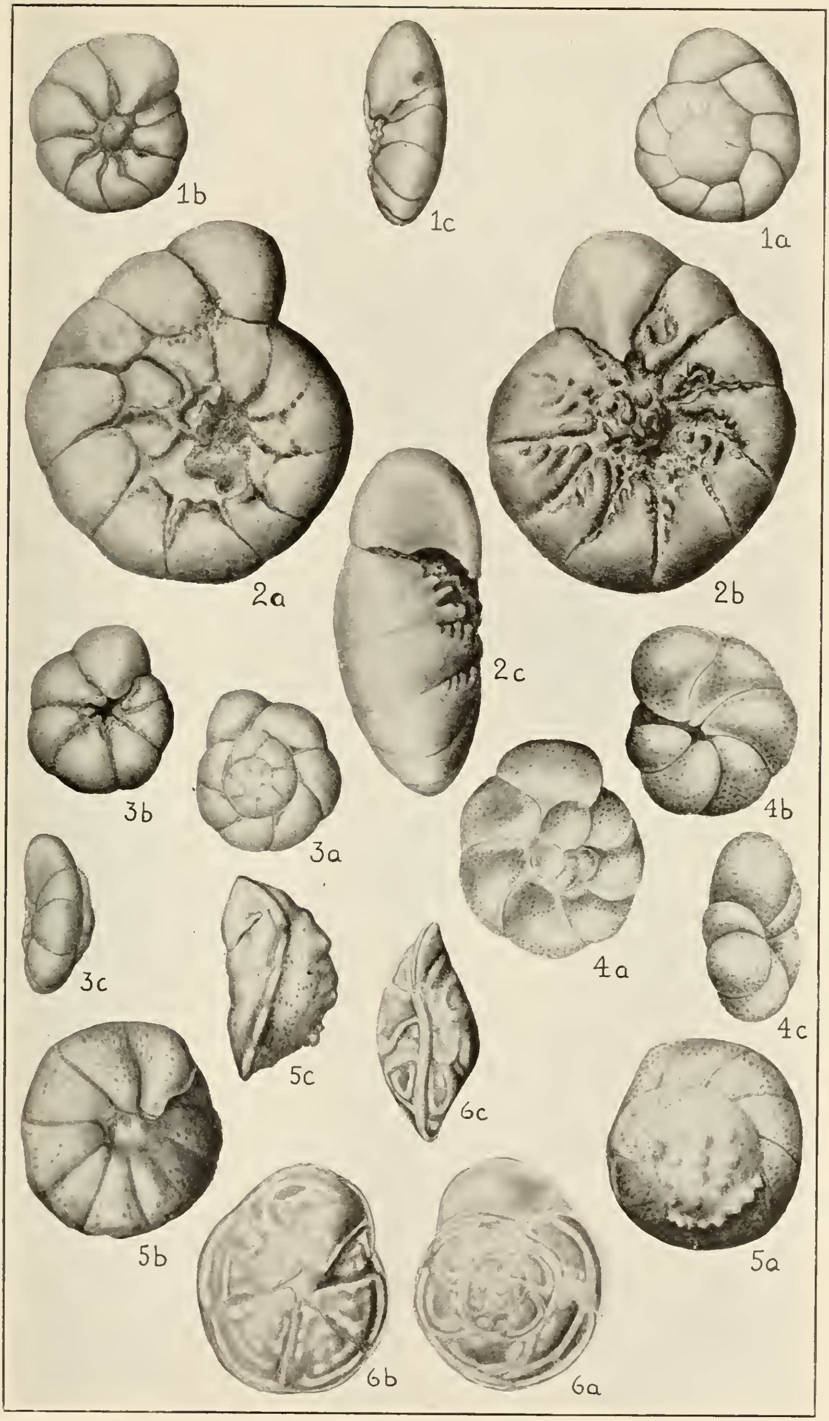
FIGURES 1, 2. *Rotalia beccarii* (Linnaeus). Fig. 1, × 50, Off east coast of United States. Fig. 2, × 75. Off coast of Belgium. *a*, *a*, dorsal views; *b*, *b*, ventral views; *c*, *c*, peripheral views.

3 *a–c*. *Rotalia beccarii* (Linnaeus), var. *tepida* Cushman. × 100. San Juan Harbor, P. R. *a*, dorsal view; *b*, ventral view; *c*, peripheral view.

4 *a–c*. *Rotalia* (?) *perlucida* Heron-Allen and Earland. × 60. (After Heron-Allen and Earland.) Off British Isles. *a*, dorsal view; *b*, ventral view; *c*, peripheral view.

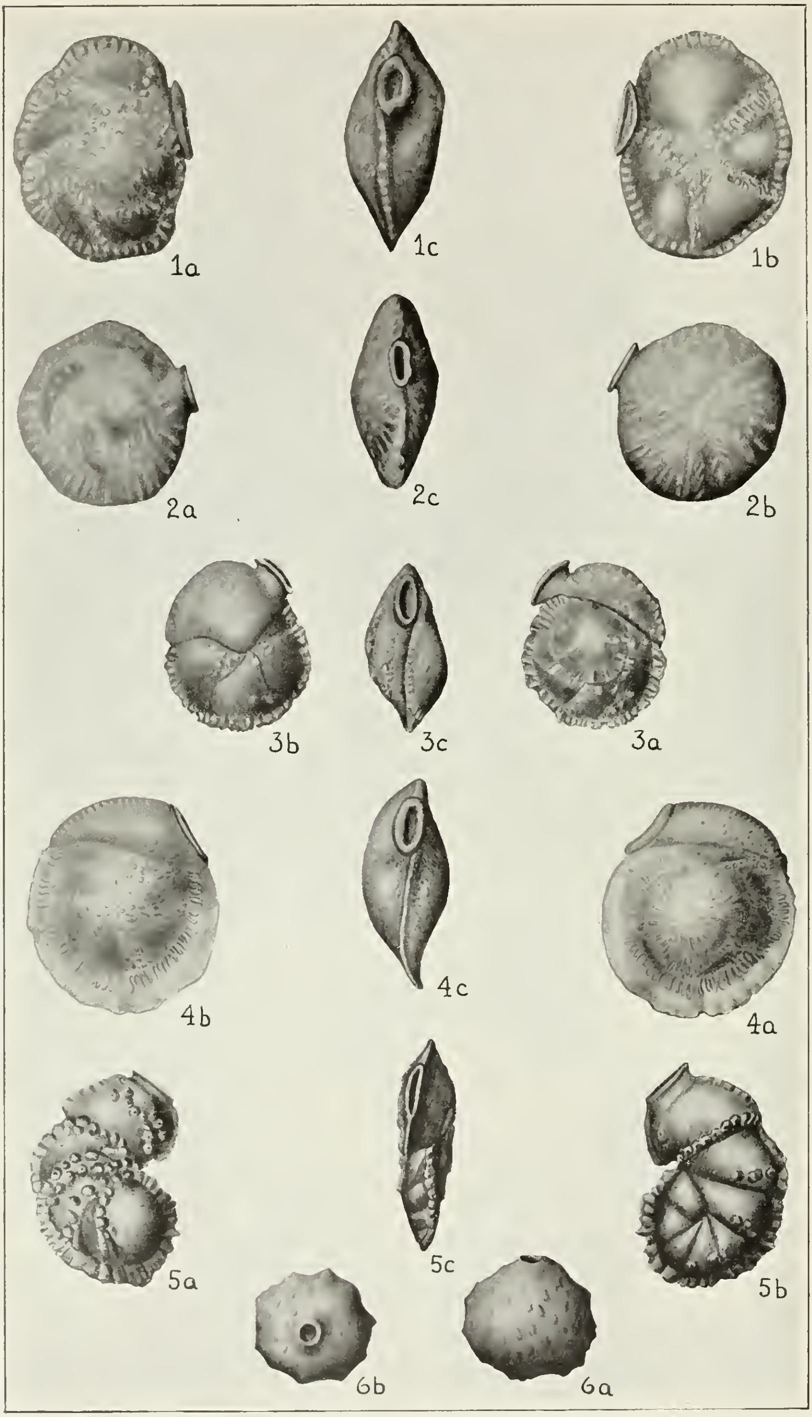
5 *a–c*. *Rotalia rosea* d'Orbigny. × 55. Off Cuba. *a*, dorsal view; *b*, ventral view; *c*, peripheral view.

6 *a–c*. *Epistomina elegans* (d'Orbigny). × 50. Off Fowey, Fla. *a*, dorsal view; *b*, ventral view; *c*, peripheral view.



ROTALIIDAE OF THE ATLANTIC OCEAN

FOR EXPLANATION OF PLATE SEE PAGE 158.



Rotaliidae of the Atlantic Ocean

For explanation of plate see page 159.

PLATE 14

FIGURES 1 *a–c*. *Siphonina reticulata* (Czjzek) (?). × 100. Coast of Belgium. *a*, dorsal view; *b*, ventral view; *c*, peripheral view.

2, 3. *Siphonina pulchra* Cushman. × 100. Fig. 3, Montego Bay, Jamaica. *a*, *a*, dorsal views; *b*, *b*, ventral views; *c*, *c*, peripheral views.

4 *a–c*. *Siphonina bradyana* Cushman. × 40. Off Cuba. *a*, dorsal view; *b*, ventral view; *c*, peripheral view.

5 *a–c*. *Siphoninella soluta* (H. B. Brady). × 75. (After H. B. Brady.) Off West Indies. *a*, dorsal view; *b*, ventral view; *c*, peripheral view.

6 *a*, *b*. *Siphoninoides echinata* (H. B. Brady) (?). × 65. Dry Tortugas, Fla. *a*, side view; *b*, apertural view.

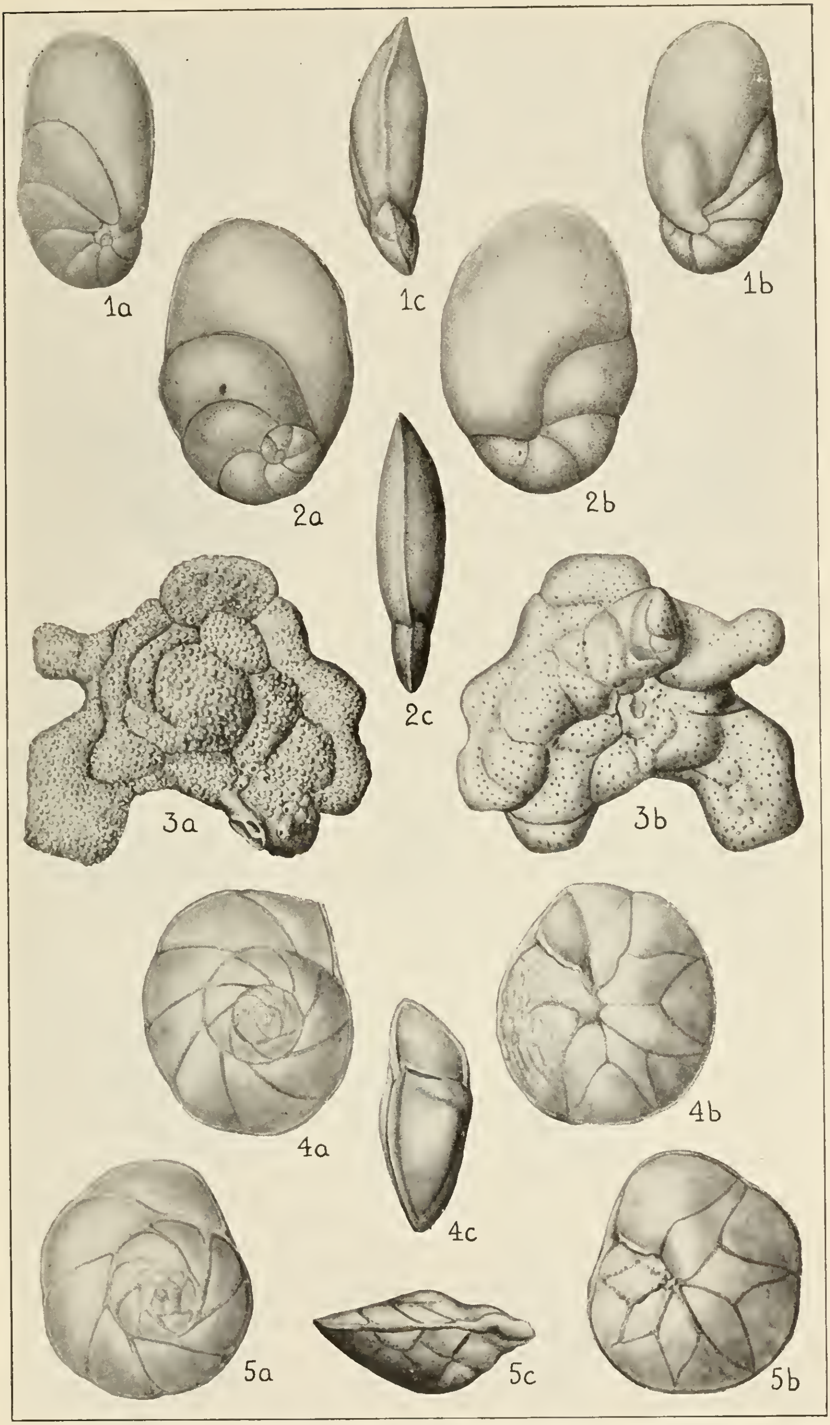
PLATE 15

FIGURES 1 *a–c*. *Cancris auricula* (Fichtel and Moll). × 75. Off Fowey, Fla. *a*, dorsal view; *b*, apertural view; *c*, peripheral view.

2 *a–c*. *Cancris sagra* (d'Orbigny). × 70. Off Fowey, Fla. *a*, dorsal view; *b*, ventral view; *c*, peripheral view.

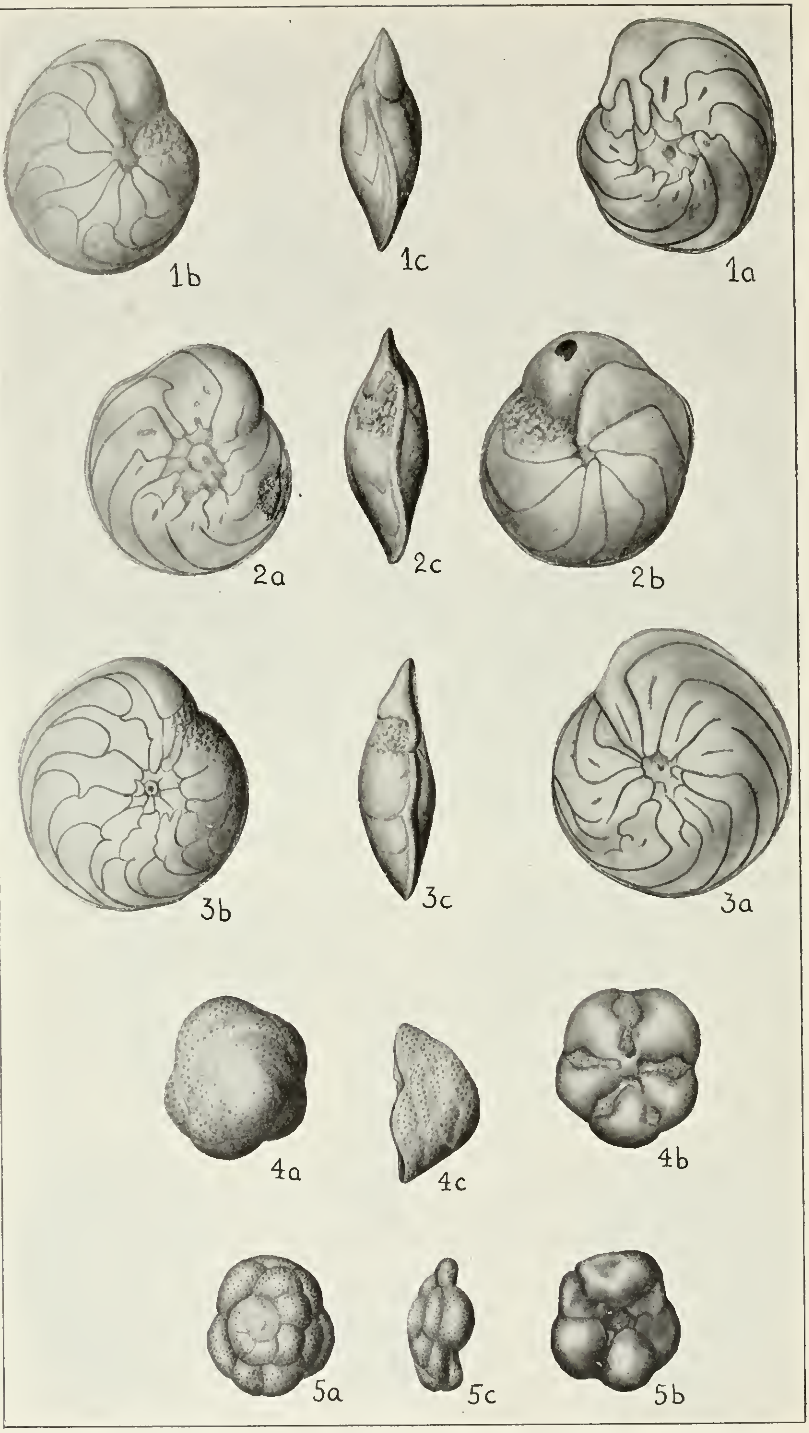
3 *a, b*. *Planopulvinulina dispansa* (H. B. Brady). × 10. (After H. B. Brady.) *a, b*, opposite sides.

4, 5. *Asterigerina carinata* d'Orbigny. × 55. Fig. 4, Havana Harbor, Cuba. Fig. 5, Dry Tortugas, Fla. *a, a*, dorsal views; *b, b*, ventral views; *c, c*, peripheral views.



ROTALIIDAE AND AMPHISTEGINIDAE OF THE ATLANTIC OCEAN

FOR EXPLANATION OF PLATE SEE PAGE 160.



AMPHISTEGINIDAE AND CYMBALOPORETTIDAE OF THE ATLANTIC OCEAN

FOR EXPLANATION OF PLATE SEE PAGE 161.

PLATE 16

FIGURES 1-3. *Amphistegina lessonii* d'Orbigny. × 45. Figs. 1, 2, Dry Tortugas, Fla. Fig. 3, San Juan Harbor, P. R. *a, a, a,* dorsal views; *b, b, b,* ventral views; *c, c, c,* peripheral views.

4 *a-c*. *Cymbaloporetta squammosa* (d'Orbigny). × 50. Montego Bay, Jamaica. *a,* dorsal view; *b,* ventral view; *c,* peripheral view.

5 *a-c*. *Tretomphalus bulloides* (d'Orbigny). × 50. Specimens without "float chamber." Montego Bay, Jamaica. *a,* dorsal view; *b,* ventral view; *c,* peripheral view.

PLATE 17

FIGURES 1 *a–c*. *Globorotalia menardii* (d'Orbigny). × 55. Off Fowey, Fla. *a*, dorsal view; *b*, ventral view; *c*, peripheral view.

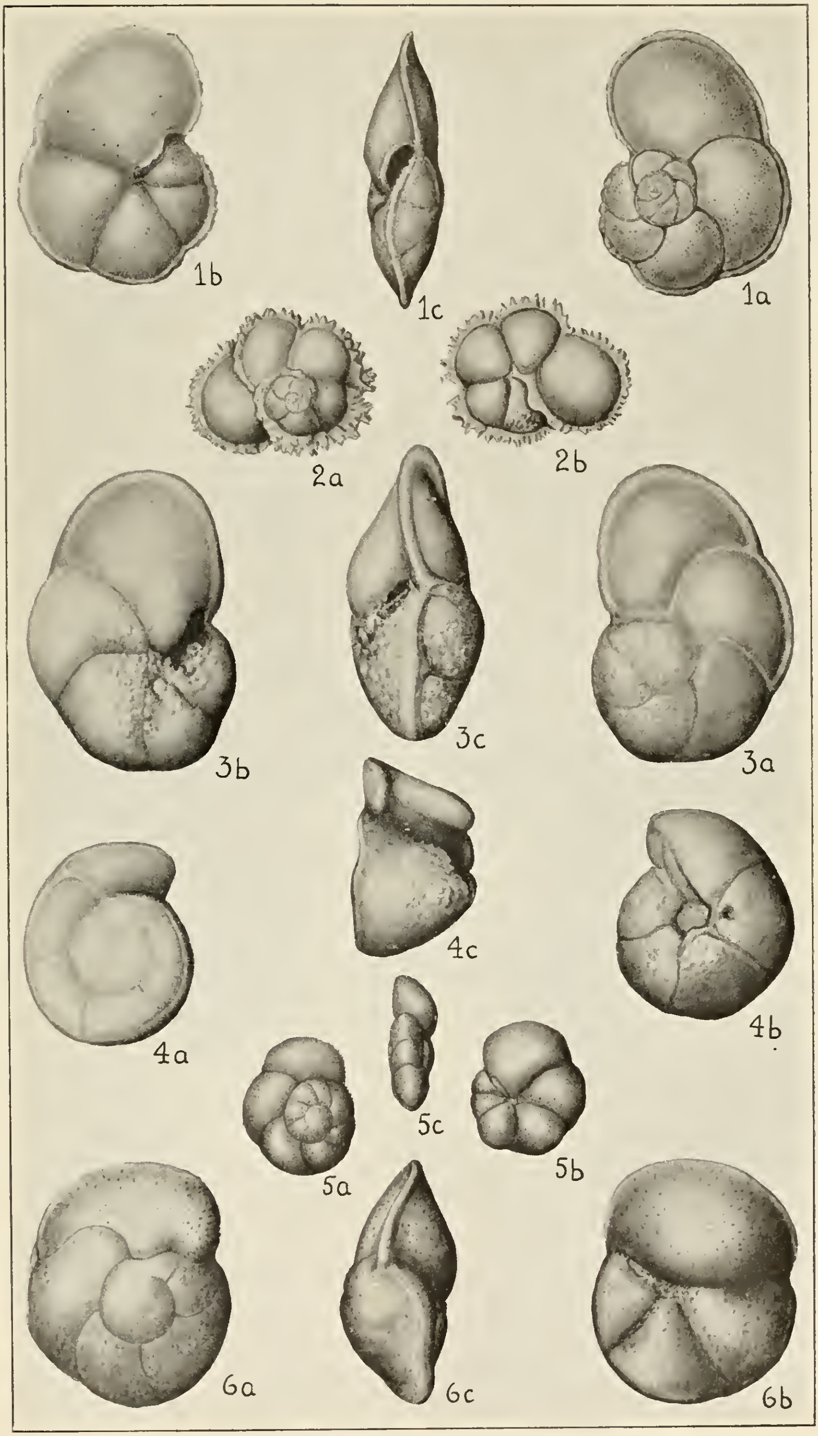
2 *a*, *b*. *Globorotalia menardii* (d'Orbigny), var. *fimbriata* (H. B. Brady). (After H. B. Brady). *a*, dorsal view; *b*, ventral view.

3 *a–c*. *Globorotalia tumida* (H. B. Brady). × 40. Off east coast of United States. *a*, dorsal view; *b*, ventral view; *c*, peripheral view.

4 *a–c*. *Globorotalia truncatulinoides* (d'Orbigny). × 40. Off east coast of United States. *a*, dorsal view; *b*, ventral view; *c*, peripheral view.

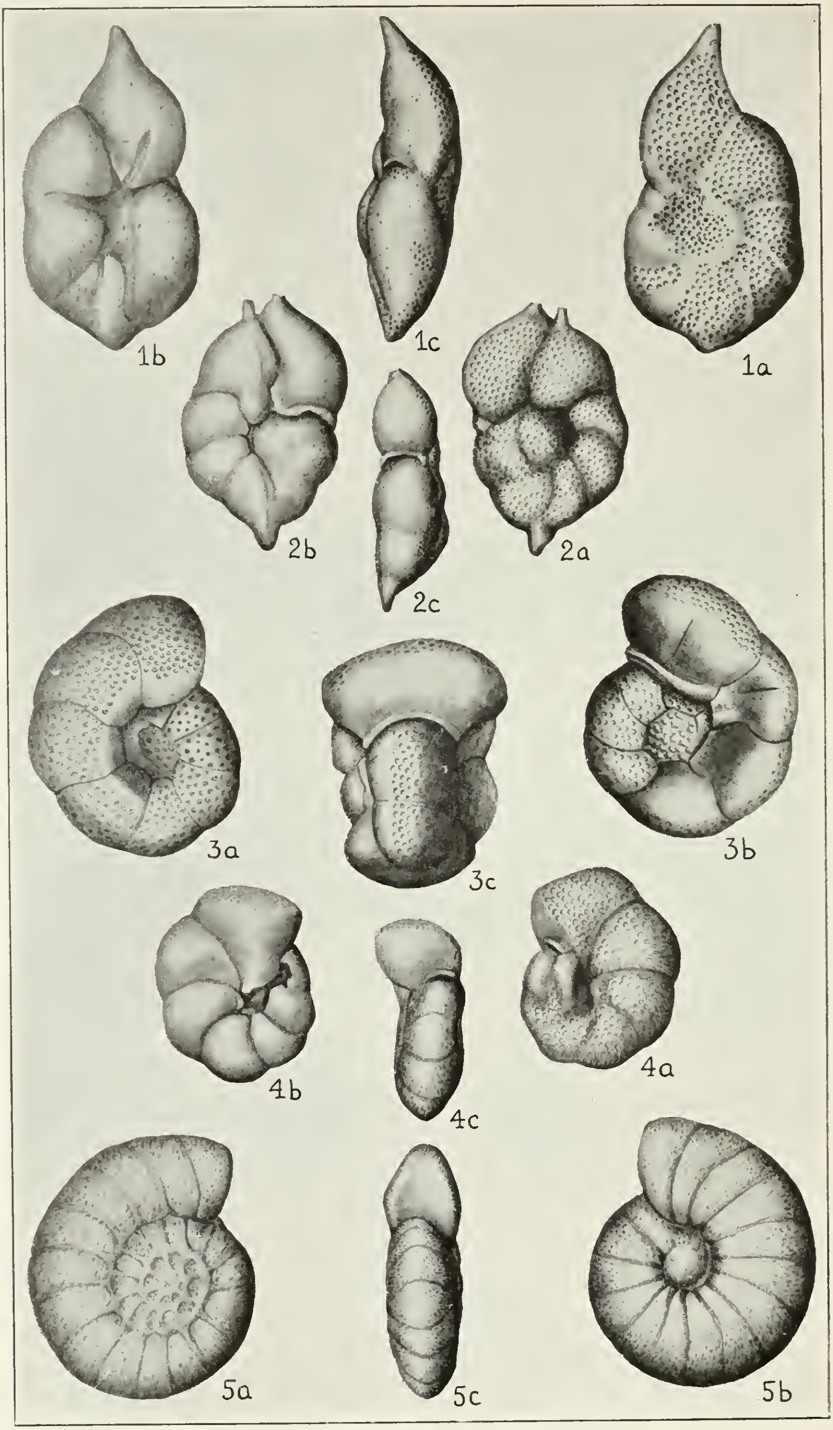
5 *a–c*. *Globorotalia scitula* (H. B. Brady). × 70. Off British Isles. *a*, dorsal view; *b*, ventral view; *c*, peripheral view.

6 *a–c*. *Globorotalia hirsuta* (d'Orbigny). × 40. Off east coast of United States. *a*, dorsal view; *b*, ventral view; *c*, peripheral view.



GLOBOROTALIIDAE OF THE ATLANTIC OCEAN

FOR EXPLANATION OF PLATE SEE PAGE 162.



Anomalinidae of the Atlantic Ocean

For explanation of plate see page 163.

PLATE 18

FIGURES 1, 2. *Anomalina semipunctata* (Bailey). × 40. Off east coast of United States. *a*, *a*, dorsal views; *b*, *b*, ventral views; *c*, *c*, peripheral views.

3 *a–c*. *Anomalina coronata* Parker and Jones. (After H. B. Brady). *a*, dorsal view; *b*, ventral view; *c*, peripheral view.

4 *a–c*. *Anomalina coronata* Parker and Jones (?). × 30. Off Fowey, Fla. *a*, dorsal view; *b*, ventral view; *c*, peripheral view.

5 *a–c*. *Anomalina flintii* Cushman, new species. × 50. Off west coast of Cuba. *a*, dorsal view; *b*, ventral view; *c*, peripheral view.

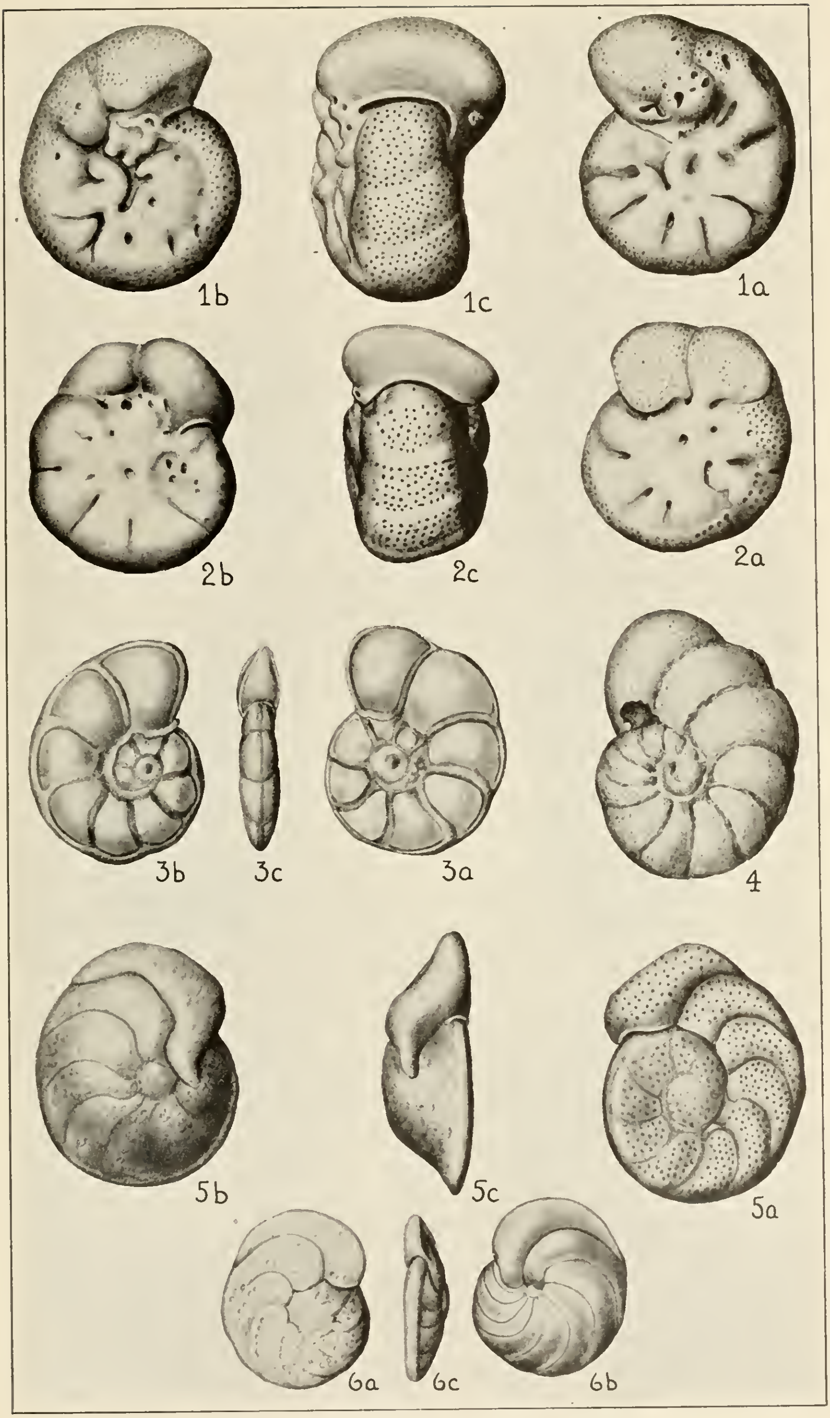
PLATE 19

FIGURES 1, 2. *Anomalina coronata* Parker and Jones, var. *crassa* Cushman, new variety. × 35. Off east coast of United States. *a*, *a*, dorsal views; *b*, *b*, ventral views; *c*, *c*, peripheral views. Fig. 2, Holotype.

3 *a–c*. *Anomalina balthica* (Schroeter). × 70. 10 miles south of Glencoe, Ireland. *a*, dorsal view; *b*, ventral view; *c*, peripheral view.

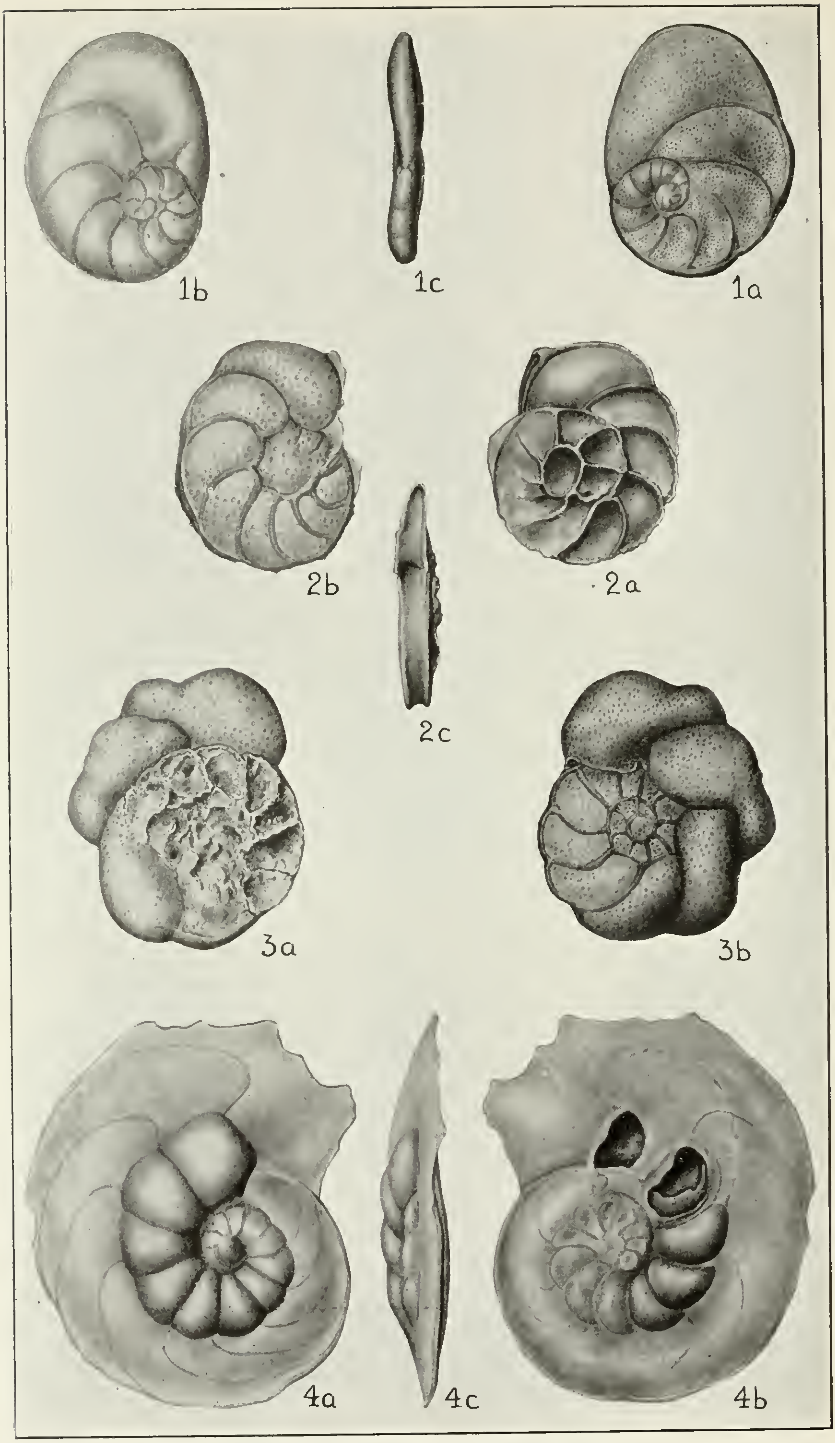
4. *Anomalina edwardsiana* (d'Orbigny). × 70. Dry Tortugas.

5, 6. *Planulina wuellerstorfi* (Schwager) (?). × 35. Off east coast of United States. *a*, *a*, dorsal views; *b*, *b*, ventral views; *c*, *c*, peripheral views.



ANOMALINIDAE OF THE ATLANTIC OCEAN

FOR EXPLANATION OF PLATE SEE PAGE 164.



ANOMALINIDAE OF THE ATLANTIC OCEAN

FOR EXPLANATION OF PLATE SEE PAGE 165.

PLATE 20

FIGURES 1 *a–c*. *Planulina caribaea* Cushman, new species. × 70. Montego Bay, Jamaica. *a*, dorsal view; *b*, ventral view; *c*, peripheral view.

2, 3. *Planulina foveolata* (H. B. Brady). East coast of United States. Figs. 2 *a–c*, × 70. Young specimen. *a*, dorsal view; *b*, ventral side; *c*, peripheral view. Figs. 3 *a*, *b*, × 50. Adult specimen with abnormal final chambers. *a*, dorsal view; *b*, ventral view.

4 *a–c*. *Laticarinina pauperata* (Parker and Jones). × 25. Gulf of Mexico. *a*, dorsal view; *b*, ventral view; *c*, peripheral view.

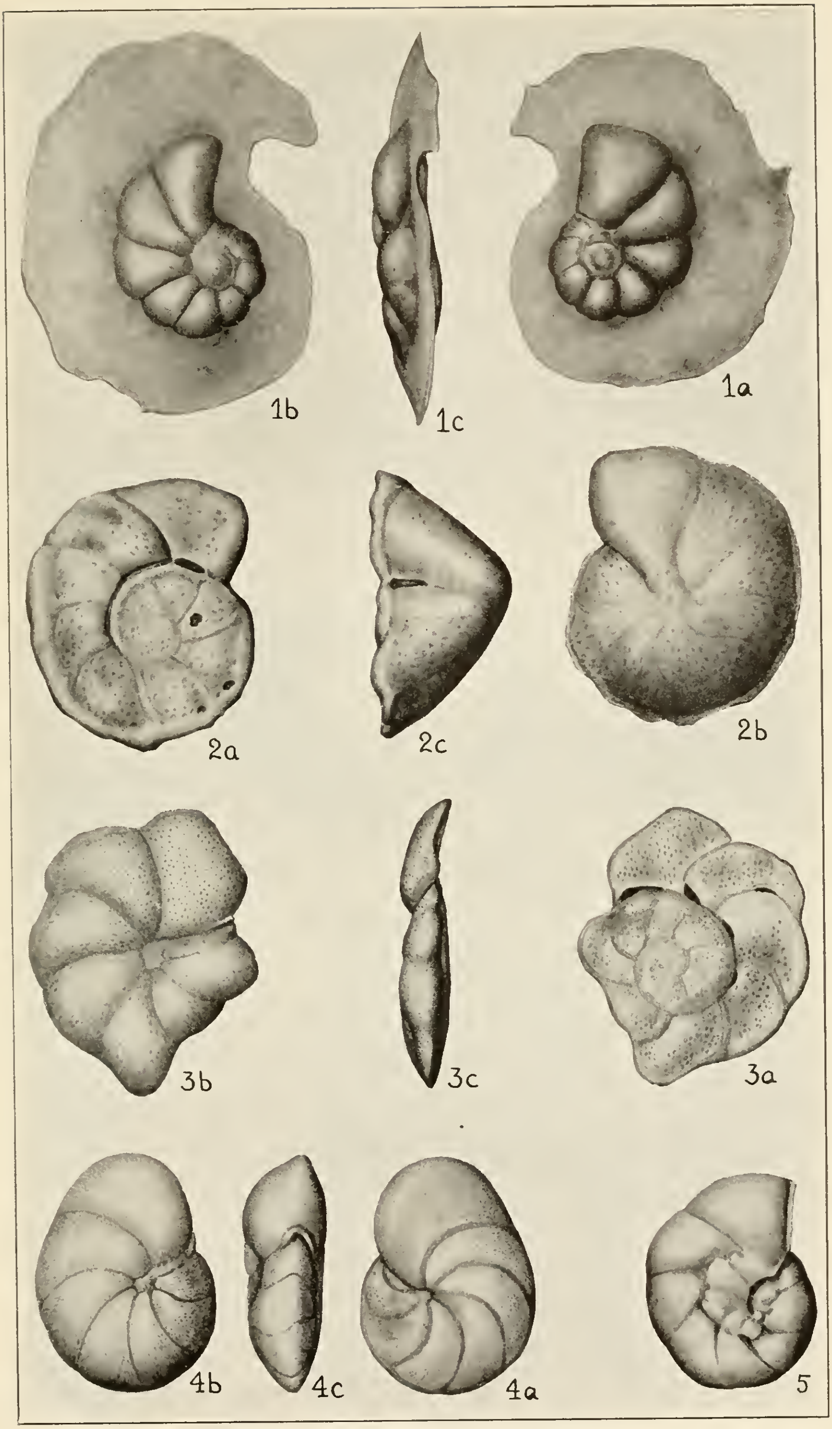
PLATE 21

FIGURES 1 *a–c.* *Laticarinina pauperata* (Parker and Jones). × 50. Off Panama. *a*, dorsal view; *b*, ventral view; *c*, peripheral view.

2 *a–c.* *Cibicides refulgens* Montfort. × 55. Off east coast of United States. *a*, dorsal view; *b*, ventral view; *c*, peripheral view.

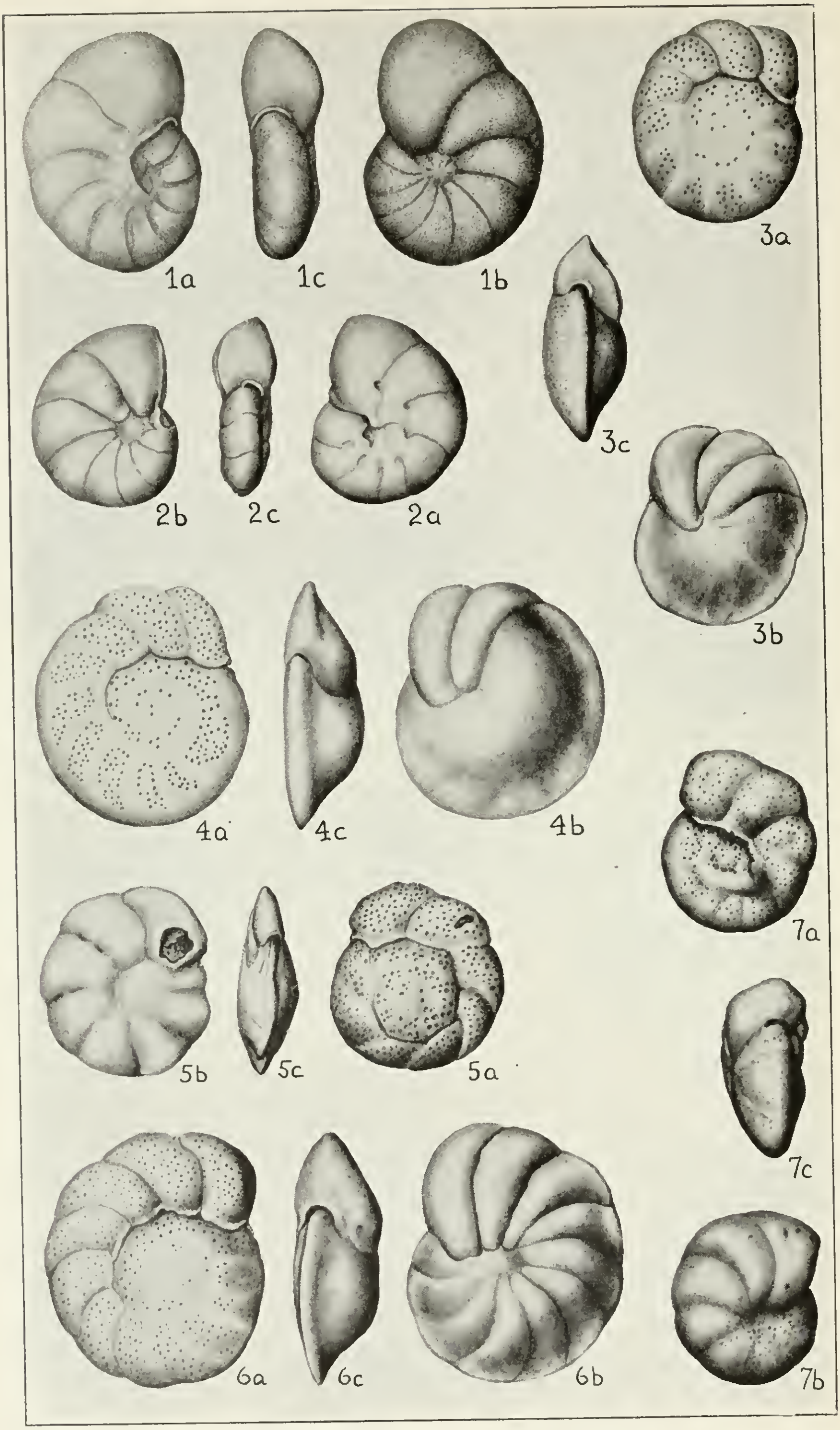
3 *a–c.* *Cibicides lobatula* (Walker and Jacob). × 35. Off east coast of United States. *a*, dorsal view; *b*, ventral view; *c*, peripheral view.

4, 5. *Cibicides concentrica* (Cushman). Fig. 4, Young. × 75. *a*, dorsal view; *b*, ventral view; *c*, peripheral view. Off Fowey, Fla. Fig. 5, Adult. × 55. Off southeastern United States.



ANOMALINIDAE OF THE ATLANTIC OCEAN

FOR EXPLANATION OF PLATE SEE PAGE 166.



Anomalinidae of the Atlantic Ocean

For explanation of plate see page 167.

PLATE 22

FIGURES 1, 2. *Cibicides concentrica* (Cushman). × 50. Off southeastern United States. *a*, *a*, dorsal views; *b*, *b*, ventral views; *c*, *c*, peripheral views.

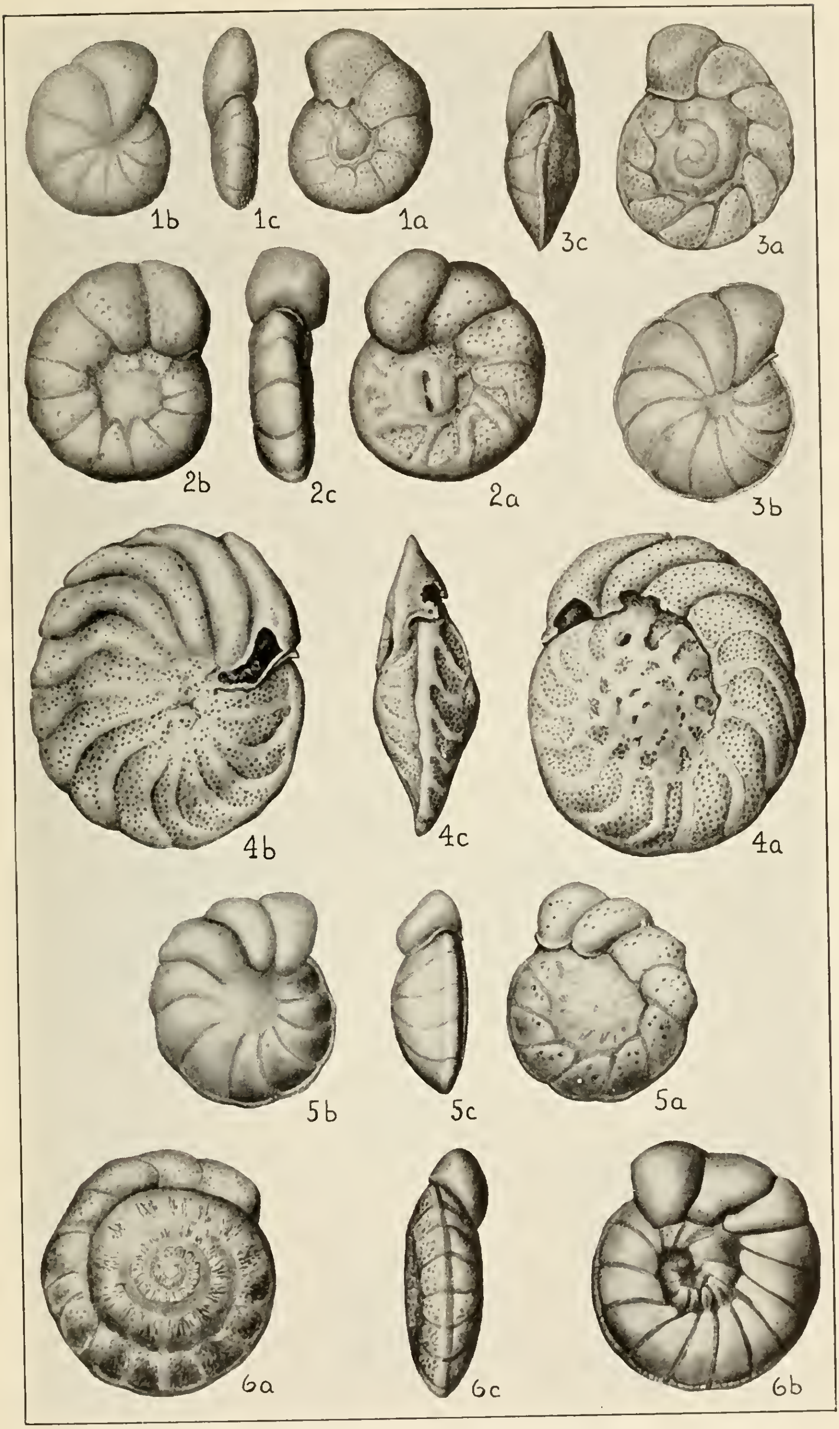
3–7. *Cibicides pseudoungeriana* (Cushman). × 50. Off east coast of United States. *a*, *a*, *a*, *a*, *a*, dorsal views; *b*, *b*, *b*, *b*, *b*, ventral views; *c*, *c*, *c*, *c*, *c*, peripheral views.

PLATE 23

FIGURES 1, 2. *Cibicides pseudoungeriana* (Cushman), var. *io* Cushman, new variety. × 50. Off coast of Florida. *a, a,* dorsal views; *b, b,* ventral views; *c, c,* peripheral views. Fig. 2, Holotype.

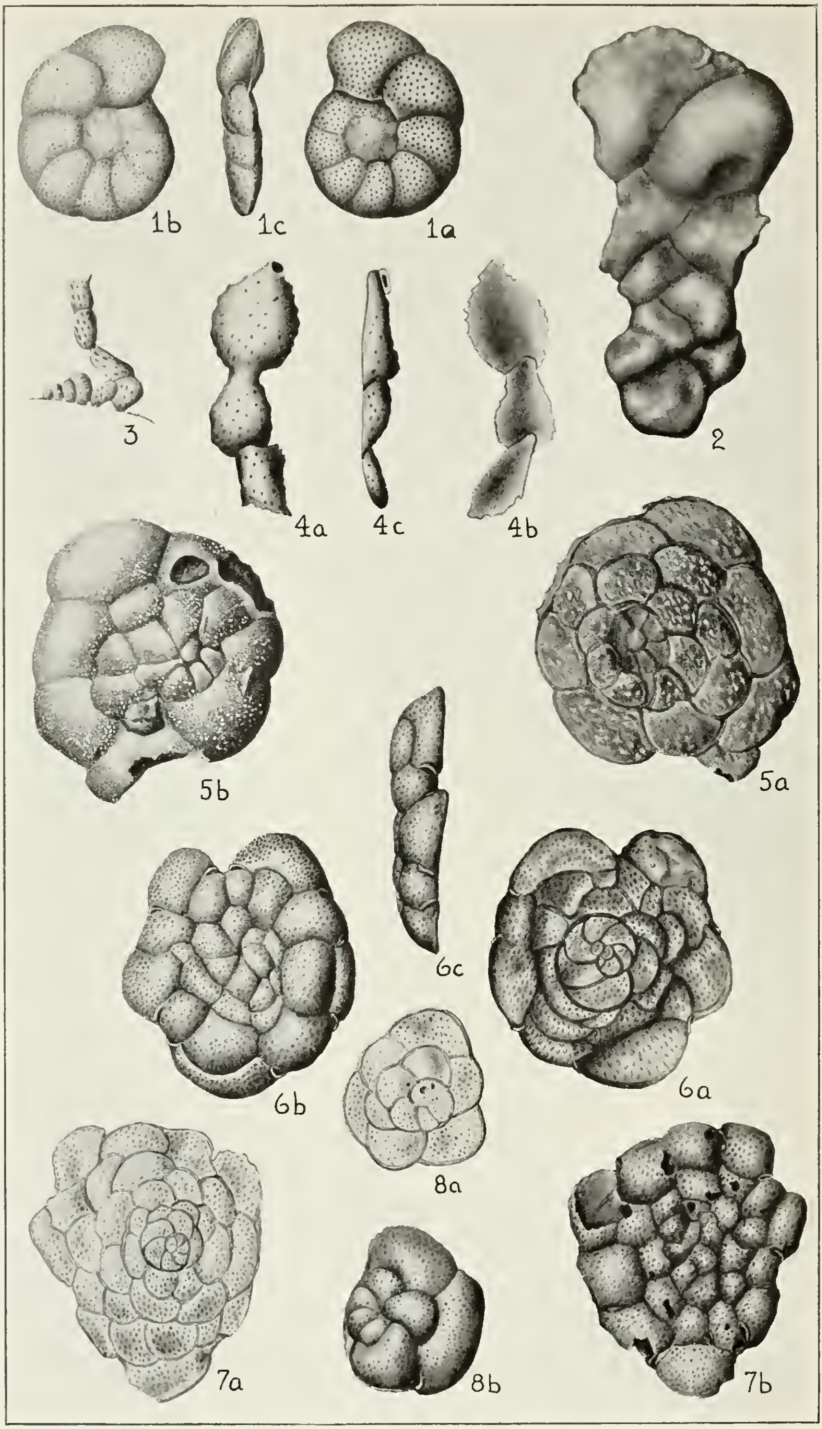
3–5. *Cibicides floridana* (Cushman). Off eastern coast of United States. Fig. 3, × 40. Fig. 4, × 35, Large microspheric specimen. Fig. 5, × 50. *a, a, a,* dorsal views; *b, b, b,* ventral views; *c, c, c,* peripheral views.

6 *a–c*. *Cibicides robertsoniana* (H. B. Brady). × 35. Off Windward Islands. *a,* dorsal view; *b,* ventral view; *c,* peripheral view.



ANOMALINIDAE OF THE ATLANTIC OCEAN

FOR EXPLANATION OF PLATE SEE PAGE 168.



ANOMALINIDAE AHD PLANORBULINIDAE OF THE ATLANTIC OCEAN

FOR EXPLANATION OF PLATE SEE PAGE 169.

PLATE 24

FIGURES 1 *a–c*. *Cibicides* sp (?). × 50. East coast of United States. *a*, dorsal view; *b*, ventral view; *c*, peripheral view.

2. *Dyocibicides biserialis* Cushman and Valentine. × 40. Off east coast of United States.

3. *Cibicidella variabilis* (d'Orbigny). (After d'Orbigny). Off the Canary Islands.

4 *a–c*. *Webbina rugosa* d'Orbigny. (After d'Orbigny). Off the Canary Islands. *a*, dorsal view; *b*, ventral view; *c*, peripheral view.

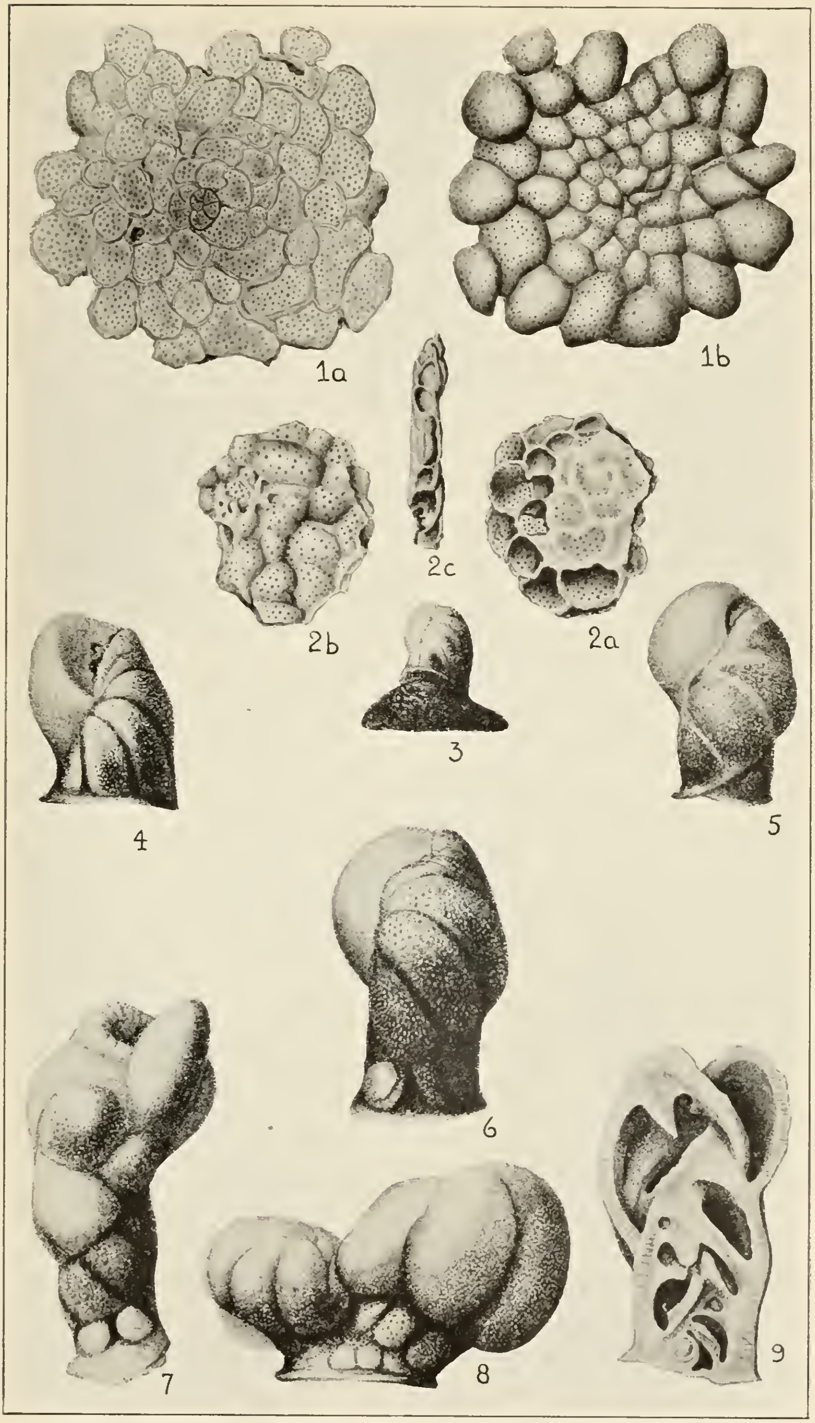
5–8. *Planorbulina mediterranensis* d'Orbigny. Fig. 5, × 75. Off Belgium. Figs. 6–8, Off Fowey, Fla. Fig. 6, × 40. Fig. 7, × 45. Fig. 8, Young stage. × 65. *a*, *a*, *a*, *a*, dorsal views; *b*, *b*, *b*, *b*, ventral views; *c*, peripheral view.

PLATE 25

FIGURES 1 *a, b*. *Planorbulina acervalis* H. B. Brady. × 40. Dry Tortugas. *a*, dorsal view; *b*, ventral view.

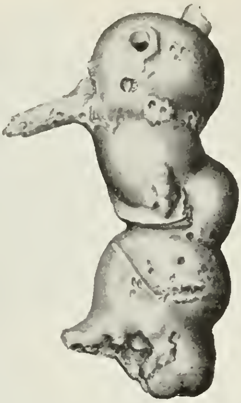
2 *a–c*. *Acervulina inhaerens* Schultze. × 50. Montego Bay, Jamaica. *a*, dorsal view; *b*, ventral view; *c*, peripheral view.

3–9. *Rupertia stabilis* Wallich. (After H. B. Brady). Figs. 3–6, Early stages. Fig. 7, Adult. Fig. 8, Double specimen. Fig. 9, Longitudinal section.



PLANORBULINIDAE AND RUPERTIIDAE OF THE ATLANTIC OCEAN

FOR EXPLANATION OF PLATE SEE PAGE 170.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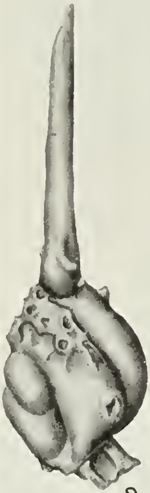
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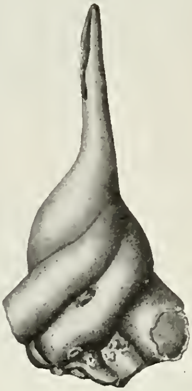
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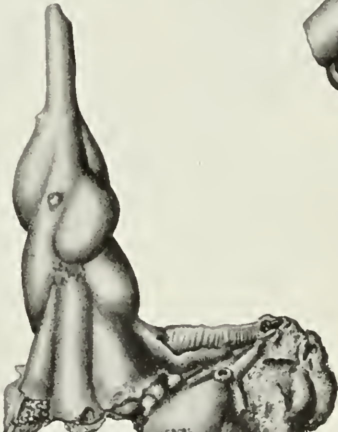
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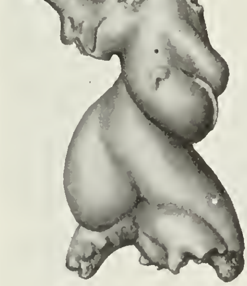
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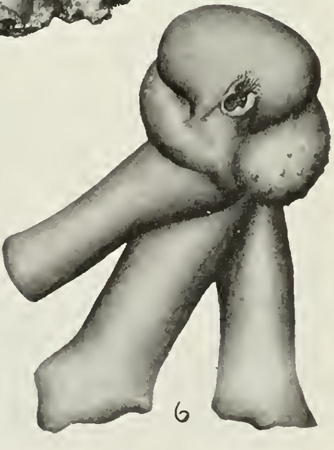
6

RUPERTIIDAE OF THE ATLANTIC OCEAN

FOR EXPLANATION OF PLATE SEE PAGE 171.

PLATE 26

FIGURES 1. *Carpenteria proteiformis* Goës. × 8. Off Barbados.

2–5. *Carpenteria hassleri* Cushman, new species. × 8. Off Barbados. Fig. 3, Holotype.

6. *Carpenteria* sp (?). × 8. Off Barbados.

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